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EDITORIAL NOTES.

Industrialists' Fuel Outlook.

THE coal stoppage of last year has much to answer for. Among other things it caused a serious hiatus in the continuity of the district conferences of the "B.C.G.A." These have now been revived, and the first of this year's series was held last Wednesday at Smethwick, the Mayor of which borough (Mr. Councillor Frank Jones), the Chairman of the Gas Committee (Alderman C. W. Pinkney), and the Gas Engineer and Manager (Mr. E. Hardiker) received the visitors with fine heartiness and hospitality. Alderman J. H. Lloyd, the Chairman of the Birmingham Gas Committee, went over to join his colleagues of Smethwick in the welcome. There is an appropriateness in starting the year's conferences in an area which is so much identified with Murdoch and the foundations of the gas industry, and, moreover, is one of the great industrial centres of the country. At the opening of the conference, there was much said as to the "oneness" of the gas industry, and this view, with operations in unity, has been brought about largely by our central organizations, which are the product of the years which have been most critical for the industry, and yet during which it has made such extraordinary headway. Due also to the central organizations bringing the administrations of gas undertakings to participate in the general work of the industry a new outlook has been created, which is of particular value in these times when municipal authorities are owners of both the gas and electricity supplies, and when so many of the councillors who are unassociated with the gas undertaking are infatuated by electricity, and yet are incapable, through lack of fundamental knowledge, of judging of the relative applicability of the two commodities to different purposes. The members of gas committees have work to perform not only of an administrative character, but in disseminating among their colleagues information which will enable them to see matters in the right perspective, and to form decisions with a due sense of suitability.

After all, in the main it is the public, through experience, who confirm or reject the decisions of even municipal councillors; and we are glad to see how emphatic were the Smethwick and the Birmingham municipal representatives at this conference in urging that the two factors upon which gas managements have to concentrate to-day are price and service. The sooner this is universally recognized in the industry, the better. No gas administrators should be able to realize this more than those who are operating in industrial areas, and are seeking to develop their day business among manufacturers. Birmingham and Smethwick realized it long ago. They found, as others have done, that the difficulties at the start of getting manufacturers to turn from their old fuel ways appear almost insuperable; and that the application of proper methods to development, which include specialist service, brings rich reward to both the manufacturers and the gas undertaking. At this conference, Dr. C. M. Walter read a paper highly appropriate to the time and the area. At head and front of the reasons advanced by the Government for their scheme of electricity generation concentration was that the better provision of a convenient form of power for industry is an essential. What the Government did not recognize (and the gas industry can compensate for the omission) is that of greater moment than power is provision for industry of heat convenient in form and price; and, on adoption, it supplies an excellent load for gas undertakings. Dr. Walter's paper shows how success can be achieved in this direction; and the success of applied methods is shown by the fact that fifteen years ago the industrial gas load (excluding gas for motive power) in Birmingham was only equal to about 5 p.ct. of the total sales, while in 1925-26 it was equal to 19·74 p.ct. In the last nine months of 1926, the period of the coal strike, it was equal to 20·01 p.ct. What these percentages mean in total figures is that in 1910-11 the industrial load amounted to 389,511,000 c.ft., with total sales at 7,693,899,300 c.ft.; while in 1925-26 the industrial consumption was 2,643,998,600 c.ft., with total sales at 13,389,831,100 c.ft. These are remarkable figures. They testify the soundness of the service policy which the Gas Committee adopted when establishing a special industrial section and laboratory, which, with the staff, is at the service of all manufacturers in the area of supply.

These district conferences of the "B.C.G.A." are valuable not only to the area in which they are held, but to the gas industry generally, if the information submitted at them is closely studied. A careful reading of Dr. Walter's contribution is recommended, for it not only indicates what is essential for developing the industrial load, but it supplies excellent exemplification of the value of the actual development to manufacturers and gas undertakings. There never was a time (making allowance for the higher cost standards of to-day compared with pre-war time, and the temporary inflictions of the coal stoppage) when the gas industry could offer to industry heat on such good terms—due not only to the broader consideration of the incidence of the costs of supplying a long-hour, large, and constant consumer as compared with a large number of small ones of equal aggregate consuming power as the one, but owing to the increased thermal efficiency of the gas process, as instanced by Dr. Walter's reference to the continuous vertical retort system, with waste-heat recovery, being carried on with a thermal efficiency of 85 p.ct. But one thing the paper especially impresses is the necessity for work to create among manufacturers a new outlook on the fuel question. It is only in recent years that some manufacturers have realized that the cost of fuel is not *per se* the test of ultimate economy in work. The collateral economies through efficiency in application of one form of fuel and the relative uneconomies produced by another have to be taken into account—the former have to be deducted from the cost of the fuel; the latter added to it. We have to try to get all manufacturers to survey the question comprehensively, and not in the old limited sense, which only results in false deductions and conclusions. The over-all works' efficiency and production results according to the form of fuel used are what should be taken into calculation, and nothing less. These are matters which are dealt with by Dr. Walter; and he does not leave himself exposed to the charge of postulation, but proves correctness by citing the experiences in actual day-by-day operation. He also shows that this industrial work is not something in which the process must be moulded to the furnace; the furnace must be brought into a suitable and pliable con-

dition to give to the process the maximum efficiency. He pays a compliment to the manufacturers of industrial gas furnaces for the work they have done in promoting thermal and working efficiency. But the end in this respect is not yet; and there is constant research for further improvement. This, combined with the increasing efficiency in gas production and the broader policy which is being applied to the gas business, constitutes a strong backing to the cultivation of a new outlook among manufacturers in respect of fuel, which will enable them to examine the question not on bare fuel cost, but on the basis of the economies which gas fuel is capable of yielding, in comparison with the known performances of coal.

Assisted Electric Wiring and the Maintenance of Gas Appliances.

We return to this subject for two reasons. The first is that, in dealing with it in our issue for March 9 (p. 578), the illustration we used, from the paper by Mr. W. F. J. Pinkney, of the Newcastle-upon-Tyne Electric Supply Company, may have created some misconception regarding the measure of activity of the Newcastle-upon-Tyne and Gateshead Gas Company in meeting competition by assisted wiring; and the second is that the information to hand shows that the adoption of the policy of assisted wiring is spreading to many places, and may become a universal policy in the electric supply industry. It is the business of the gas industry not only to note this development, but to act in response. Maintenance of gas appliances is the way.

Regarding the first point, let us say at once that were we asked for leading models of good service and active business methods in the gas industry, we should give the Newcastle Gas Company a forefront place for the quality, comprehensiveness, and intensity of their business protection and developing methods, through which they have been highly successful in combating the keen rivalry of their electrical competitors. It will be remembered that Mr. Pinkney stated that in 1926 his Company added 16,472 new consumers to their register; and of these 10,071 were obtained under the assisted wiring scheme—2689 paying monthly rentals, and 7382 through prepayment meters. In considering these figures, it must be remembered that they apply to a considerable area—an area vastly exceeding that of the Gas Company. As a matter of fact, the Electric Supply Company and their associated companies cover practically the whole of Northumberland, Durham, and North Yorkshire—with certain exceptions, such as Sunderland, Darlington, &c. Mr. Pinkney in his paper stated that they supply a large number of towns and villages—large and small. According to information published a couple of years ago, this huge organization covers some 1400 square miles of territory; and the population in it is upwards of 2 millions. Within a substantial part of the city of Newcastle, another Company—the Newcastle District Electric Lighting Company—operate. Thus the figures quoted by Mr. Pinkney are not as they stand applicable to the area of the Newcastle Gas Company alone, being the aggregate from the whole of their immense area. If any reader of the "Journal" thought otherwise, the information now given will correct the mistake.

At the same time, the Gas Company do not by any means regard the competition as negligible; they have taken it very seriously, and treat it actively, with an efficiency and result which was so well reflected by certain statistics given by the Chairman (Mr. J. E. Cowen) in his address to the proprietors at their recent meeting (see "Journal," March 16, p. 677). During last year—the one to which Mr. Pinkney's figures refer—the Gas Company supplied 10,000 new gas-fires, 6000 cookers, 3000 wash-boilers, and 9000 lighting fittings. When house-to-house canvassing is adopted by electrical people with the view of attempting to withdraw custom from gas, it is necessary for the latter to apply counteractive measures. The Newcastle Company have a special staff of canvassers, well primed in matters affecting the competition between gas and electricity; and there is no question as to the effectiveness of their work. They not only succeed in ensuring the retention of many consumers who have been induced to contemplate a change, but they bring in many additional orders for new appliances. We have before us a sample monthly report on this work. In the one month the special staff made 4000 calls; and many householders (we have the exact figures at hand) who had under consideration an electrical installation decided not to proceed with it, while many others were still wavering—there being on balance a comparatively modest number of electrical "prospects" compared with the number before the visits were paid. An equally important fact is that in these houses, and as a result of the visits of members of the Gas Company's special staff, orders were, in the one month, secured for 30 gas-fires, 13 cookers, 3 wash-boilers, 436 lighting fittings, and 451 burners. In the same month, in the Gas Company's whole area, gas lighting has been substituted for electric lighting in thirty cases, and five radiators and a cooker have been displaced by gas.

These data are an illustration of the value of personal contact by qualified men; and this is where maintenance comes in. Maintenance means satisfaction and new business. The Newcastle Gas Company have no fears of maintenance involving them in greater liability. If it did, they would be perfectly willing to shoulder it. They realize fully that one of the best means of combating electricity is to ensure that the condition of a customer's appliances is such that he can obtain from them the maximum possible service. A succinct account of the evolution of maintenance work by the Newcastle Gas Company was given in the "Journal" (see Nov. 10 last, p. 370) by the Chairman of the Company at the time of the annual meeting of the "B.C.G.A.;" and at the recent "Inspection and Maintenance Conference," Mr. Cowen, who presided, made it clear that he and his colleagues were out completely for doing all those things which the new conditions require to safeguard the progress of gas. We wish that view prevailed throughout the industry to-day. We firmly believe that it will not be long before it does, other than in those places where content reigns through a sleepy indifference, and where an ugly shock will some day give birth to the wish that things had not been allowed to drift.

The Coke-Oven Gas Tributary.

The question of coke-oven gas for town supply received prominence in the address of Col. H. K. Stephenson at the annual meeting of the proprietors of the Sheffield Gas Company. It is to-day a highly important theme—not only from the economic standpoint, but from that of the continuity, in times of trouble in the coalfields, of the supply to purchasers in bulk. The position demands protection for the latter, in order that there may be no drawback to the realization of the ambition to contribute, by utilizing bye-product coking gas to the best advantage, to the conservation of coal. There is evidence that the administration of the Sheffield Gas Company believe it to be their duty, providing the terms of supply are satisfactory to them and their consumers, to take coke-oven gas to the fullest limits permitted by circumstances. The Board of Trade Returns show that the Company took in 1925 1,849,299,000 c.ft. of coke-oven gas. To them there is now being delivered 5,500,000 c.ft. per day. That is a serious contribution to have cut-off suddenly, as was the case at the commencement of the coal stoppage; and on that account it was necessary for the Company to make provision for carbonizing 400 tons of coal per day more than would otherwise have been required. Nevertheless, the Directors propose to enter into an agreement for a further supply of 3,500,000 c.ft. per day as from the autumn of 1928, which will make their total custom with the coke-ovens 9 million c.ft. per day. Using the 400 tons which had to be carbonized in addition to normal as the divisor of the delivery of the 5,500,000 c.ft. per day, we have 13,750 c.ft. per ton; and adopting these figures as an approximate basis for calculation, the 9,000,000 c.ft. daily purchase from coke-ovens will mean that 650 tons less coal per day will require to be transported to the Company's works, handled, and carbonized there than would otherwise be the case. Without going deeper than that, it is plain that there is, from the point of view of the national fuel supply, an economic advantage

in such mutual business relationships between the coke-oven owners and town-gas distributors.

Col. Stephenson asserts that the potentiality of coke-oven gas in regard to general town supply has not received the consideration it deserves; but there is confidence from what has already been done—in connection with not only gas, but other products—that the two great carbonizing industries will be drawn closer and closer together in business relationships. The rate of progress, so far as gas supply is concerned, will depend on two factors—one, price; the other, continuity of supply in times of weak markets for metallurgical coke, and of stoppages in the mining industry. So far as price is concerned, Col. Stephenson says it would be far more profitable for coke-oven gas producers to sell their gas at 6d. per 1000 c.ft. than to use it themselves, as it is understood that it is not worth to them more than 3d. On the other hand, gas undertakings cannot afford to pay more for the gas than the net cost of manufacturing on their own works; and the price must be less than this, as otherwise there would be no reason or incentive for relieving coke-ovens of their production. But if the value of the gas to the coke-oven owners for their own use is only 3d. per 1000 c.ft., then there is a margin between that and the net cost of locally produced town gas within which to operate, and provide in the bargain a profit for both buyer and seller. This brings us to the other point, that something must be done to ensure continuity of supply. There is the closing-down of ovens owing to the decline in the demand for metallurgical coke; but the coke-oven owners are looking for pastures new, and, by blending coals and suitably regulating the carbonizing process, they have discovered how their production can comply with requirement in fields which the gas industry has hitherto regarded as its special province. If this sort of thing develops, and a change-over can be readily effected from coke for one purpose to coke for another, the decline in demand for metallurgical coke will not disturb gas output from many coke-oven plants. As to the complete stoppage of gas supplies when difficulties induce the miners to withdraw their labour, that is a more troublesome problem. Col. Stephenson (as did Mr. Ralph Halkett a few months ago) commends this as something worthy of the consideration of the National Fuel and Power Committee. It comes well within their purview, as they have been appointed to consider, and advise upon, questions connected with the economic use of fuels and their conversion into various forms of energy, having regard to national and industrial requirements, and in the light of technical development. We can, however, at present see no way of effecting a solution other than legislating for the detachment of coking plants from coal winning, and otherwise ensuring that work at the ovens is not interrupted by trouble at the collieries. There is no identity between the work of coal raising and that of coal carbonization. Anyway, it is important that the uneconomy produced by having to provide stand-by plant on gas-works taking coke-oven gas should be done away with if there is to be full development of the utilization of that gas for town supply.

The Company are to be congratulated on their maintenance of the supply of gas to the community throughout the stoppage, without the inflow of 5,500,000 c.ft. of gas from the coke-ovens. Situated as they are, they were in a fortunate position to stock heavily before the stoppage; and as early as July they began to purchase outcrop coal, which was mixed with the coal in stock, and thus assisted in making it spin out. The Company must have had a unique experience with outcrop coal; for no less than 116 different samples were tested by them, to ascertain their suitability for gas making. Of these, only eleven produced gas in a sufficient quantity for use; and only one or two samples gave any coke worthy of the name. Later on, foreign coal was purchased, but that delivered to Sheffield was found to be inferior in quality, and fabulous in price. These were some of the difficulties with which the Company were faced. Nevertheless, they did not increase the price of gas until September, and the total addition made at intervals was but 6d. As was pointed out in our issue for March 2 (p. 542), the Company have given notice of material reductions which will have effect from the March readings. Another experience is that during the coal stoppage of 1921, the demand for gas decreased in the Company's area; but during that of 1926 increases soon began to take place, and in some weeks were as much as 25 p.ct. These and other points are interesting; but the outstanding one in respect of policy in relation to the co-ordination of fuel use and coal economy is that referring to coke-oven gas supply.

Gas Legislation.

It is known that some time ago the National Gas Council appointed a Committee to discuss with the Board of Trade the question of the proposed new gas legislation. In addition, they have deputed to a separate Committee the duty of exploring the position as affecting non-statutory gas companies and small undertakings.

Electricity on the Therm Basis.

Some time ago, when comparison of gas and electricity prices was rife, we mildly suggested that, in order to obtain uniformity of the basis of contrast of the two, it would be a good thing if electricity were sold per therm. Seeing that it requires about 29 units of electricity to equal one therm, the electricity industry did not jump at the idea—in fact, it was unkindly passed by in silence. In the "Hastings and St. Leonards Observer" for March 12, we see that Mr. G. H. Ormerod, of St. Leonards-on-Sea, has made a similiar suggestion. He fears that there is some foundation for the complaint of unwholesome competition of the rate-supported electricity undertaking with the Gas Company; and he thinks this might be to some extent mitigated if electricity undertakings, when marketing heat, were compelled, as are gas undertakings under the Gas Regulation Act, to quote their rate per therm. He suggests that a short Bill to accomplish this would surely receive the almost unanimous support of Parliament, as it is "in the direction of a rational system of weights and measures." Whether or not Mr. Ormerod is correct in his supposition that there would be almost unanimous support by Parliament, certain it is that the electricity industry, backed by the Electricity Commissioners, would resist to the utmost of its power the passing of any such measure, which would show what a thin amount of potential heat energy is given by electricity for a given price. The gas industry would, of course, raise no objection to its competitor coming on to the therm basis.

Coal Stoppage and Belgian Gas Supply.

Another sidelight on the coal crisis of last year comes to us from the pen of M. Eg. Adry, of the Antwerp Station of the "I.C.G.A." Writing in the Official Yearbook of the Antwerp Chamber of Commerce, he points out that coal stocks at one juncture were so depleted as to give rise to grave anxiety among all the manufacturers of the town, not least to the gas undertakings. Indeed, the Authorities had to consider the possibility of rationing both the public and the private supplies of gas; but wise direction and management of the undertaking averted the crisis, and the consumers as a whole were completely unaware of the predicament. M. Adry's article is reviewed at some length in later columns.

Coal Imports during February.

The quantity of coal imported during February was 338,236 tons, with a declared value, c.i.f., of £925,038. This represented the continued working-off of contracts for foreign coal entered into during the coal stoppage.

Regaining Markets.

In a message from Germany, it is stated that the volume of British coal imports into Northern Germany is smaller than before the coal strike; but strong efforts are being made to regain the old position. This is being done by lower prices. One class of British household coal, which was fetching 23s. per ton before the stoppage, is now being sold at 20s.

Coal Output.

The returns as to coal output continue to show that a good standard of working is being maintained. During the week

ended Feb. 26, the production was 5,371,400 tons; the number of wage earners being 1,012,700. These figures compare with 5,365,900 tons, and 1,010,500 workers, in the week ended Feb. 19. During the week ended March 5, the quantity of coal raised was 5,318,600 tons; and the number of workpeople was 1,015,000—the production being equal to 5·24 tons per worker.

Mr. Cook in the Corner.

The "Red" Secretary of the Miners' Federation finds that Moscow is not Berlin or London. There has been a meeting of the Committee of the International Miners' Federation in Berlin; and two subjects have been under discussion arising from the coal stoppage. There has been a movement from the side of the British Miners' Federation for evicting Mr. Frank Hodges from his position as Secretary to the International Miners' Federation; the excuse being that he has been elected a member of the Central Electricity Board. Before his election to that position, Mr. Cook made it perfectly clear that Mr. Hodges' attitude during the coal stoppage had given him great offence, and that he should do his utmost to get him removed from the position of Secretary to the International Federation. The matter has been referred by the latter to a Committee of three members—the President of the German Miners' Union, the President of the Belgian Union, and Mr. A. J. Richardson, the Treasurer of the British Miners' Federation. It is clear that the miners' representatives of other countries are not prepared to sacrifice Mr. Hodges, at the behest of Mr. Cook and his associates, without thorough investigation. The second matter in which Mr. Cook was concerned, and which could not have been palatable to him, was a joint statement sharply protesting against, and rebuking him for, his attacks on the Miners' International during his Moscow visit. The leaders of the Continental Unions have requested the British Federation to use their influence to prevent a repetition of such attacks, and to define their official attitude with regard to them before the next Committee meeting. This Mr. Herbert Smith promised should be done; and he very lamely added that, if the allegations about Mr. Cook's speeches in Moscow were true, he had no hesitation in declaring that they had better not have been made, for, if the leaders of the movement were discredited, the movement itself would also be discredited. Mr. Cook cannot feel very comfortable in the face of the views of his colleagues regarding his conduct.

Tide of Employment.

The latest returns of the number of persons on the registers of the employment exchanges in Great Britain show that on March 17 there were 1,144,100. The reduction during the week was 25,383; but the total figure is 50,018 more than in the corresponding week of last year.

"B.E.S.A." DRAFT STREET LIGHTING SPECIFICATION.

In connection with two papers on illuminating engineering and street electric lighting read at the Institution of Electrical Engineers' meeting in London on Thursday, March 3, there were distributed copies of a draft specification for street lighting which has been prepared by a Committee of the British Engineering Standards Association. This, of course, relates to both gas and electric lighting, and no reference is made in the specification to either form of luminant. Mr. C. C. Paterson, the Chairman of the Committee, introduced the specification, and we give below his remarks, together with some others on the general question.

Mr. Paterson said the street lighting problem was an urgent one. The draft specification had taken two years to prepare. It was put forward with some confidence and with entire unanimity, and in the hope of its receiving constructive criticisms and suggestions. It was specially desired that the preface to the specification should be read before judgment was passed upon it. Those who would say that the specification did not go far enough should bear in mind that at present there was no classification and no criterion at all for the guidance of those responsible for the ordering or for the supply of street lighting installations. Furthermore, there were at present no generally recognized technical conditions for acceptance of maintenance tests for street lighting installations. Neither was there much in the way of generally accepted good practice to guide them. In saying this, he was not overlooking certain authorities who for many years had required their lighting contractors to maintain, under penalty, a certain standard of illumination in the streets which they contracted to light. Therefore, it was felt that the right course was to lay down a broad classification in terms of illumination, framed in such a way that it would not hinder future developments of the art. Everyone agreed that illumination was probably the dominating factor in good street lighting. It was also agreed that diversity of illumination and glare also played important parts. Knowledge of these factors, however, was not yet precise enough for them to be incorporated in mandatory clauses of a specification. There was, however, a basis for defining glare, due to Bordoni; and the Committee considered this ought to be made available in a tentative way to those concerning themselves with street lighting. With the help of Mr. J. M. Waldram, this glare proposal had been elaborated and reduced to the form of a definite criterion applicable to street lighting installations, and it formed one of the appendixes to the draft specification. Its application was not mandatory; but suppliers of, and tenderers for, installations under the specification were required to work out and state this glare figure in each case, for the guidance of the purchaser. The Committee had deliberately discarded any attempt to classify streets according to traffic or other similar gradings. In Table I. they gave seven classes of streets graded according to the minimum illumination which they purported to have. Having done this, the Committee considered it was the duty of the local authority to decide what class of street under the specification was suited to the local requirements. Later on, traffic authorities might think it desirable to attempt some standardization on this point; but in the absence of any strong demand for it, the Committee felt it would be a mistake to make even an attempt at this stage. The actual mandatory clauses of the specification were simple, and few in number. Clause 8 defined the illumination for each "B.E.S.A." class of installation, and clause 10 safeguarded the public in the matter of the maintenance and the running of installations at a reasonable state of efficiency. The remainder of the specification consisted mainly of clauses necessary for making practical the intentions of the above two clauses. The only exception was clause 12, which was in the nature of a safeguard against "grossly" glaring installations. This clause prescribed the minimum mounting height for each class of street, requiring, naturally, that for the higher candle-power units greater mounting heights should be used. Clause 13 required that posts should not be further apart than a distance equal to twelve times their height; and this mainly concerned the lowest categories of lighting installations, and particularly those which bordered on what the preface referred to as "beacon" lighting. The specification contemplated two values for defining an installation—first, that for which it was designed and to which it must comply when first accepted, when everything was clean and properly adjusted; and, secondly, that below which it must not be allowed to fall by the maintenance authority when reasonable allowance was made for solid surfaces, variations in burners and lamps, and fluctuating gas pressure or electrical voltage. The second condition is permitted, as a minimum, to be one-half the first. Thus, a class D street, with 0·2 foot-candle when tested under ideal conditions, must not fall below 0·1 foot-candle under ordinary maintenance conditions. The practical operation of these clauses demanded carefully drawn-up conditions under which tests should be made of installations, first for acceptance when new, and, secondly, in subsequent service; and these test conditions were laid down in clauses 15 to 20. There were four appendixes. No. 1 expanded the testing clauses in certain detailed particulars. No. 2 was for the purpose of illustrating and making clear the sense in which the expression "mid-span point" was used in the specification. No. 3 gave figures to assist in correcting the candle-power of electric lamps back to normal volts, and No. 4, with its set curves, gave all the directions necessary for finding what was the "glare" coefficient for installations. This specification was not regarded as more than a first step, but the Committee felt confident that, if adopted and used, it could not fail to help forward the art of street lighting in this country. In conclusion, Mr. Paterson, on behalf of the Committee, acknowledged assistance from many sources, not forgetting the labours of Mr. Trotter's Committee which reported in 1913 and which worked under the auspices of the Illuminating Engineering Society.

Mr. Frank Bailey said he attributed the success of the street lighting in the City of London entirely to the care with which the design was considered; every part being tested for a year before being erected for actual service. The centrally suspended lamps had proved a great success from every point of view; and he wished it were possible to remove every lamppost in the city.

Mr. W. J. Jones (a member of the "B.E.S.A." Committee) looked forward to the time when street lighting would be carried out in terms of visibility. They ought not to be satisfied merely with defining the amount of glare. The specification made no attempt to classify streets; but he could not help feeling that the time had come when some Committee should deal with this very important matter of street classification.

Captain W. J. Liberty (Secretary of the Institution of Public Lighting Engineers) was in entire agreement with Mr. Bailey in describing the lighting in the City of London as more or less ideal. There were many advantages to centrally suspended lighting. With lampposts, half the light was on the walls of the buildings, and only half in the roadway. He wished to back up all that Mr. Paterson had said with regard to the draft specification.

Mr. Walsh said that the Department of Scientific and Industrial Research had in progress a fundamental investigation into glare; and they should soon have more data available with regard to this question.

PERSONAL.

Mr. SAMUEL BROWN, J.P., has been appointed Chairman of the Kingston-upon-Thames Gas Company, and Mr. EUSTACE SHERRARD Vice-Chairman, owing to the death (as announced elsewhere) of Mr. E. T. Coppinger, J.P.

Mr. HARRY HOPKINSON, who has recently been appointed Secretary of the Chester United Gas Company, has been presented by the office staff of the Company with a silver cigarette case suitably inscribed, as a mark of congratulation on his appointment.

OBITUARY.

We regret to learn that Mr. EDWARD THOMAS COPPINGER, J.P., died on Feb. 26, in his 81st year. He had been a Director of the Kingston-upon-Thames Gas Company since 1899, Vice-Chairman from 1911 to 1926, and Chairman for a few months—since Oct. 21 last. Mr. Coppinger was Mayor of Kingston in 1890, and had been a Justice of the Peace for the borough for many years.

The death has occurred suddenly of Mr. AUSTIN GEORGE WHILE, Chairman and Managing Director of the Swindon United Gas Company. Deceased, who was 80 years of age, had an attack of influenza, but recovered, and went to recuperate. He had intended returning home last Friday, but died on the Thursday. Mr. While was born at Treforest, near Pontypridd, in 1846, and removed to Swindon twenty years later. He made his first investment in the Swindon Gas Company in 1868, became a Director in 1875, Vice-Chairman in 1906, and Chairman in 1916. To celebrate his eightieth birthday in October last, and also the completion of fifty years as a Director of the Company, Mr. While gave a dinner to the Directors, officials, and a few friends, when he was presented with a silver cigar and cigarette box. For a few years he was a member of the Swindon Town Council, retiring in November, 1925.

FORTHCOMING ENGAGEMENTS.

March 24.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to the Stanton Ironworks.

March 25.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute. Short papers by Mr. J. H. Goldsmith and Mr. S. H. Miles.

March 26.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Visit to the Dundee Gas-Works.

March 26.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to the Tradeston Gas-Works, Glasgow.

March 30.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Annual general meeting at the Hotel Cecil, Strand, W.C. 2, at 2.15.

April 1.—BRITISH COMMERCIAL GAS ASSOCIATION.—North Wales, Cheshire, and Lancashire District Conference at Wallasey.

April 2.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Annual meeting and dinner at Parker's Restaurant, Manchester. Paper by Mr. A. McCulloch on "The Coking of Coal."

April 8.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual spring meeting at Dumbarton.

April 12.—FEDERATION OF GAS EMPLOYERS.—Meeting.

April 12.—NATIONAL GAS COUNCIL.—Meeting.

May 5.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Spring meeting at Ipswich.

May 5.—NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—Annual meeting at Newcastle.

May 19.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—Meeting at Abergavenny.

May 20.—BRITISH COMMERCIAL GAS ASSOCIATION.—Manchester District Conference at Buxton.

May 26.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Spring meeting at Dudley.

May 26.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual general meeting and dinner, at the Hotel Cecil.

July 12.—NATIONAL GAS COUNCIL.—Annual meeting.

INSTITUTION OF GAS ENGINEERS.

April 11.—Council meeting.

June 14-17.—Annual General Meeting in London.

ELECTRICITY SUPPLY MEMORANDA.

THERE are a few matters we should like to discuss with Mr. G. S. Haydon, Assoc.M.Inst.E.E., the Resident Engineer of the North Wilford Power Station, Nottingham. In the "Memoranda" for Jan. 26, reference was made to a lecture he delivered, early in January, before the Nottingham Society of Engineers. A full account of his performance is now before us. Much of the information of which it is composed has been read before. But there are in it certain statements which, we incline to think, Mr. Haydon will not be prepared to prove; and we say, without fear or trembling, that he has been dipping into real absurdity with the view of making points. He says that the science of illumination has developed to such an extent, and decorative work and colour schemes are so skilfully interwoven, that intensive illumination can be carried out without any semblance of glare detrimental to the eyes, and perfect diffusion can be obtained. Of course, he does not say "at an enhanced cost." Householders of small means could not, with electric lamps of high intrinsic brilliancy, do what ought to be done in order to protect their eyesight. He also asserts that it is "quite impossible to obtain equal service with gas; and there is no gainsaying the fact that, as a medium for light, its days are numbered, and the gas undertakings know it, although they still put up a fight where possible, which is, perhaps, only natural." This is interesting; and Mr. Haydon is a prophet—whether a false one, time alone can show. But in what way is it impossible for householders to obtain equal service with gas? With similar illuminating power, one can obtain a light by gas of better quality and much lower intrinsic brilliancy than by electricity; and therefore less harmful if unshaded, as so many lights have to be in the homes of the mass of the people. Strange as it may appear to Mr. Haydon, the night load of gas undertakings continues to increase; and the total gas sales of the industry, according to the Board of Trade Returns, advanced from 235,402,824,000 c.ft. in 1920 to 265,757,353,000 c.ft. in 1925—an addition to business of no less than 30,354,529,000 c.ft. Compare these remarkable figures with Mr. Haydon's flimsy statement! Equal service with gas can be realized—service more economical, less damaging to the eyesight, and certainly more dependable, without involving the need of keeping candles in the store cupboard as a stand-by.

Electrical Piffle.

Altruism and Philanthropy.

We hope the electrical industry is not proud of technicians who descend into such paltriness as is found in these sentences from Mr. Haydon's lecture:

> The altruistic has no place in the minds of the gas authorities. It does not matter much to them whether your ceilings get blackened and your decorations spoiled, and that you breathe poisonous fumes, so long as they sell their gas. And yet they are quite philanthropic, as no doubt at present gas goes a long way towards keeping the match factories going; and it would be a pity if half of them had to close down, and more unemployment be the result. It is also, of course, quite immaterial to them that several million homes want electric light, and would benefit hygienically and financially.

Such piffle ought not to find place in a technical lecture. We hardly see how altruism in the minds of gas authorities has anything to do with the choice of the public in the matter of the agent selected for illumination; and, as for the blackening of ceilings, if consumers of gas utilize burners of good type, and see they are adjusted to local gas conditions, there is not the slightest reason why their ceilings should become darkened, other than by the dust that is found in the atmosphere of all towns. In many places, we have seen patches of dirt on the ceilings of rooms in which electricity is utilized. Why is that? It is not due to products of combustion, but to the humidity of, and dust in, the atmosphere. Talking of dirt, too, the glass shade of a gas-burner can be cleaned, the bulb of an electric lamp cannot, except on the outside; and the gradual darkening of the inside of the bulb means light depreciation. That by the way. A serious assertion by Mr. Haydon is that, through the combustion of gas, householders breathe "poisonous fumes." Will he tell us actually what are those poisonous fumes as applied to (say) Nottingham or any other gas, and the proportions in which they are emitted from bunsen flames, and are present in the atmosphere, under a given set of conditions? That is one of the points on which, when we have his reply (if he will favour us, and not beat a quiet retreat), we should like to have a little discussion. The foolish reference to match factories needs no comment; but the point that householders benefit hygienically and financially through the change from gas lighting to electric lighting is not in accord with, on the one hand, chemical tests of stagnant air in occupied electric-lighted rooms, and, on the other, general experience.

Gas Cooking and Further Absurdity.

A little later in the lecture, we come across the statement relating to gas: "One has to consider the effect of the products of combustion. On the food being cooked it becomes dry, and has not that sweet taste given either by coal-heated ovens or the electric ovens." How positive, and again how silly! Let us consider Mr. Haydon's illogical statement. How can the products of combustion of gas affect cooking food? What with poisonous fumes and badly cooked food, we ought all to be in a better land than this. Mr. Haydon's idea is that gas causes food to be-

come dry, and, in some mysterious way, to lose its sweet taste. The products of combustion of gas largely consist of water vapour and carbon dioxide. Now how on earth can an atmosphere saturated with hot water vapour cause the food to become dry, and why should the heat of gas deprive meat or any other food of its sweet taste? What difference is there between the heat of gas or electricity that one should have different effects from the other in respect of its action upon the quality or flavour of the food undergoing cooking? With the millions of gas cookers in use, and with our principal caterers, for very good reasons, using gas for cooking, and their establishments popular and profitable, where is the ground for such stupid statements as are quoted from this lecture? It is time that the postulating electrical critics looked deeper into these matters, instead of adopting the cheap-jack method of making superficial assertions which have no fundamental truth. There is also the statement regarding the variations in the shrinkage of meat cooked by different agents. Given equal temperatures, how heat from one source should affect a joint in a different way from that obtained by other means is really beyond our comprehension. Perhaps Mr. Haydon, who evidently claims to be an authority on this matter, will enlighten us; for up to the present, although this piece of foolishness has been trotted out by men associated with the electricity supply industry for two or three decades past, no electrician has ever yet been able to give a satisfactory explanation. It all simply means that, to suit electricity, chemical and physical facts are abused at every turn. We will leave the matter there, in the hope that Mr. Haydon will accept our invitation to a little discussion of these subjects. We are sure he will forgive us calling a spade a spade, and those things silly which are obviously so.

Demand and Price. Just a little comment on another point in the lecture. Mr. Haydon mentions that electricity must be produced from instant to instant as it is used; and therefore the capacity of machinery, cables, and staff must be equal to the greatest demand which all consumers together are likely to make at any time of the year. The supplier is forced to recognize that the total cost of generating and delivering a unit of electricity into the consumer's premises consists of something like three-quarters fixed charge, and one-quarter running charge. From this (particular attention should be paid to the argument) it follows that the consumer who uses electricity for only a short period each day, and just when all the other consumers demand it, costs, and must be charged, a great deal more than the consumer who, at the same rate or speed of use, consumes many units in the year—that is to say, employs electricity for long hours. That statement is worth examining. In some areas the peak load is through industrial requirements in the daytime. The machinery and cables provided for meeting the industrial load—involving capital expenditure, maintenance, and renewal charges—constitute a large part of the fixed charge which has to be provided for the maximum load at any given time. In such cases, it is the lighting load which helps to keep the machinery running during the hours of poor industrial demand. It is the reverse of what used to be. Take certain of the peak loads which gas undertakings experience, and suppose these were transferred to the electricity supply industry, and that each undertaking would have to provide generating plant, cables, and staff to meet those short periods of maximum demand. In many residential districts, it is Sunday morning when the demand for cooking produces the peak load of the week. Then in winter, on a sudden drop of temperature—sometimes combined with fog and darkness—peak loads again come upon the gas undertakings such as are not, generally speaking, experienced at other times of the year. Such loads would be most uncomfortable for many electricity suppliers. They are only short-time uses, and yet present remarkable peaks. Let us reiterate what Mr. Haydon says: "It follows that one who uses electricity for only a short time each day, and just when all the other users demand it, costs, and must be charged, a great deal more than he who, at the same rate or speed of use, consumes many units in the year—that is to say, employs electricity for long hours." Apply that dictum to the gas-cooking load at dinner time on Sundays, and the flights of the heating load in winter (both of which are not long-period uses), then consumers employing electricity for those purposes ought not to be supplied at a low rate.

Expediency. But, of course, it is well known that electricity suppliers have long since abandoned those fine mathematical calculations which they at one time applied in fixing their tariffs; and, in place of them, expediency has been installed, and expediency affords, in relation to cooking and heating, the contradiction of the argument for short-time users being charged the higher prices. We have Mr. Haydon saying that nothing could be less equitable than to sell units of electricity at the same price for all purposes and at all times. The value of service rendered to the consumer also bears largely upon the use to which he applies the electric energy. As an example, he refers to an undertaking selling electricity for lighting at 7d., and much more electricity at anything between 2d. and 1d. for other purposes. To decide suddenly that everybody should pay an average price, which might be (say) 2½d. per unit, would (Mr. Haydon says) simply mean that all the lighting consumers would get their light at about one-third of what it is worth to them, while the power consumers would be charged considerably more than the power was worth to them, or they could afford to pay for it. The result would be that most of the power business would disappear; the lighting business might increase, and bankruptcy would arrive in a short time. This all shows how expediency has really a greater governing power in the making of electrical tariffs than the rule to which attention is called in the previous paragraph. Who can blame the electricity industry when 29 units are required to give the consumers 1 therm?

Increase in Capital Expenditure. The electricity undertakings of the country do not hesitate to face new capital expenditure for the supply of areas outside the original scope of their service. We have the case of the Hastings Town Council, who, at their last monthly meeting, accepted the recommendation of the Electricity and Public Lighting Committee that application be made to the Electricity Commissioners for sanction to the borrowing of a sum estimated at £70,667 for carrying out the scheme for the supply of the Borough of Rye, the Battle Urban District, the rural districts of Hastings, Rye, and Battle, and the parish of Ninfield. They are intending to apply to the Unemployment Grants Committee or the Electricity Commissioners for a grant towards the cost. Why there should be any allowance for this work by either of those two bodies on the ground of unemployment is not particularly evident, in view of the fact that the extension is simply a development of the Corporation undertaking, and will be carried out whether or not there is a grant as suggested. The Committee also obtained the endorsement of the Council to a scheme, which will cost £27,376, for the construction and equipment of additional sub-stations, which the Electrical Engineer notifies are required owing to the increase of load on the mains. The load on the mains is not the only load that is increasing.

Municipalities and Electrical Developments. Many of the municipalities whose electricity stations are unlikely to be earmarked as "selected" stations under the new scheme of electricity generation for the country are beginning to show much anxiety and perturbation over the insistence of the Electricity Commissioners in pursuing a course which will contribute to concentration as early as possible. The Middlesbrough Corporation have failed to find that they are likely to benefit in any way by continuing to be patrons of the Cleveland and Durham County Electric Power Company; and they are satisfied that the people of the borough would be more economically served from their own electricity plant. Therefore, they applied to the Commissioners for sanction to borrow £141,346 for the erection of a station. In their decision, the Commissioners state that, after examination of all the information before them, they are not persuaded that, having regard to all the circumstances of the case, the Corporation would, if consent be given, be in a position to give a supply of electricity, adequate in quantity and regularity, to meet the present and prospective demands of their consumers at a cost not greater than that at which they could give a supply obtained from the Power Company. They have therefore refused their consent. The Commissioners express the opinion that the price of the bulk supply should be fixed at £2 7s. per KW. per annum, and 0·3d. per unit on certain specified conditions.

Mishaps. There have been two or three timber yard fires just recently; and, in connection with at least one of them, the information was given that the fire originated in a portion of the establishment in which electrically-driven machinery was used. Whether or not the electric motors had anything to do with the destruction, in this and other cases, nobody can tell, owing to the fires having wiped-out all traces of origin. It was reported from Brussels last Wednesday that, owing to fire which broke out that day in the Anglican Church in the Rue Stassart, at Ixelles—a suburb of Brussels—the building was completely destroyed. The fire is attributed to a short circuit in the electrical organ-blowing apparatus. Public interest was recently aroused by a small fire which broke out in Australia House in the Strand. It originated in the window of the Orient Shipping Company's office, where a rotating electric sign became ignited as the result of a fused electric wire. The flames caught a large model of a steamship, and partly burned it. Harry Muir, a miner, of Cowdenbeath, was recently electrocuted while experimenting with electricity. The body was found lying face downwards on an electric wire near his house. It appears that deceased had an intimate knowledge of electricity, and for many years had been experimenting with it in various ways.

INAUGURATION OF NEW PLANT AT BLACKBURN.

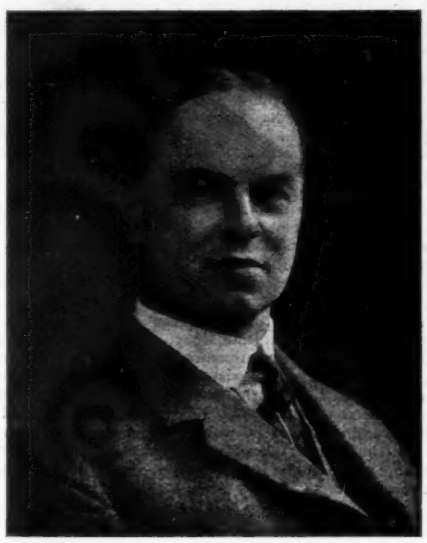
CARBURETTED WATER GAS PLANT AND ADDITIONAL STORAGE.

A Model Works.

On Wednesday last, March 16, Councillor E. HAMER, J.P., Chairman of the Blackburn Corporation Gas Committee, formally opened a new carburetted water gas plant by Humphreys & Glasgow, and a two-million spiral-guided holder by R. & J. Dempster, Ltd. Both units embody the latest practice. The former is equipped for the operation of the Young-Whitwell three-phase cycle back-run process, which has on several occasions been the subject of comment in our columns, and which has been extensively adopted in America—a country where carburetted water gas is a large proportion of town gas. The holder, which is fully described later, is the result of Messrs. Dempster's wide experience; and this statement alone is sufficient to indicate that incorporated in its design are all the best improvements in modern gasholder construction. The guide rollers are of the "Bearscot" all-steel four-roller type, and the dip carriages are linked in pairs.

A SPLENDID SITE.

The site of the Greenbank Gas-Works at Blackburn is ideal. The large area, which offers unlimited possibilities for future extensions, evoked many expressions of appreciation from the large gathering of engineers who were present at the inauguration ceremony last week, and there are doubtless engineers who, having to cope with extension work on sites considered cramped years ago, envy Mr. G. P. Mitchell, the Engineer and General Manager of the Blackburn concern. Every experienced engineer, however, who inspects the Greenbank Works admires the masterly manner in which Mr. Mitchell has designed the lay-out of the various units of plant. In this respect he has shown great foresight—a vision which will be of inestimable benefit to succeeding engineers at Blackburn, and, indeed, to the consumers there. Perhaps the most important point about the reconstruction work is that, notwithstanding the amount expended, the capital per million c.ft. of gas made has been reduced. The sum charged to capital account for the extensions was £284,500; and with the increased production of gas the capital per million c.ft. has been reduced from £805 in 1919-20 to £633 in 1925-26; the remainder being paid out of revenue without increasing the price of gas. Indeed, the charge to-day is 1s. 1d. per 1000 c.ft. less than it was before the alterations were commenced.



COUNCILLOR E. HAMER
Chairman of the Gas Committee.

CULTIVATING THE SPIRIT OF GOODWILL.

The employees of the Blackburn Gas Department are well cared-for, with the inevitable result that an excellent spirit of goodwill exists between employer and employed—without which spirit no undertaking, gas or otherwise, can hope to achieve success in the future. Large mess-rooms are provided for the men, and the wash-house is fitted with lavatory basins, shower baths, and a steam-heated drying room. And the various shops —blacksmiths', mechanics', &c.—are clean and light, and are equipped with all appliances calculated to render the men's work pleasanter and more efficient. The shops alone would serve as a model for many industrial concerns, and typify Mr. Mitchell's thoroughness.

The arrangement of the stores is admirable. In the general stores, which are 55 ft. long by 32 ft. wide by 21 ft. 6 in. high, are bins and racks for the various machine parts, &c.; and every article has a distinguishing number. The card system is employed, which enables the storekeeper to ascertain at once the state of the stock of any particular item. This system is worked in conjunction with the Head Office by a daily return of goods received and issued. In the cooker and gas fire store, the cookers are housed at ground level, and the fires, plate racks, &c., on a gallery along each side of the building. The arrangement is such that all incoming goods are received at one end of the building, and issued from the opposite side. Adjacent to this store is a cooker repair shop.

Mr. G. P. MITCHELL, M.I.Mech.E.,
Engineer and General Manager.

The extensive site allows of tennis courts and a bowling green, and football and cricket fields. There is also a social room for the employees.

MAINTENANCE AND SHOWROOMS.

In 1900 the total gas made by the Blackburn undertaking was 618 million c.ft. By 1920 it had risen to 811 millions, and by 1926 to nearly 1165 millions. This development has not been effected without efforts to ensure customer satisfaction; and it is noteworthy that Mr. Mitchell has a maintenance scheme which is greatly appreciated in the district. In organizing this scheme it was found essential to take a census of premises and gas apparatus in use. For the working of the maintenance system, the area of supply is divided into sections.

There are well-equipped showrooms in King William Street, which is the chief shopping centre of the town. An illustrated description of these premises will appear in the next issue of the "GAS SALESMAN."

INAUGURATION CEREMONY.

Councillor HAMER, inaugurating the carburetted water gas plant, explained that this had been installed to take the place of the obsolete plant at the Addison Street Works, and the chief object was to provide a unit capable of coping with emergency demands. It had been brought into operation on May 5 of last year, and had been of the greatest possible help during the coal strike, in which period it had more than repaid the cost of its installation. It was a unit of the latest type.

Alderman T. SHARPLES, the Vice-Chairman of the Gas Committee, then started the steam turbine blower.

Before opening the outlet valve of the new holder, Councillor HAMER said that additional storage had been the subject of discussion for some considerable time. As long ago as 1915 the late Sir Corbet Woodall had advocated the erection of a holder on the very site of the new one. Since that date the capacity of the works had grown from 2 million c.ft. to 7¼ millions per day; and, therefore, the need for increased storage was apparent. Councillor Hamer said he felt sure that the new holder would be a great asset to the Blackburn undertaking.

LUNCHEON.

Following the opening ceremony, the visitors were conveyed to the Town Hall, where they were entertained at luncheon by the Mayor (Sir William Forrest, O.B.E.) and Corporation of Blackburn.

After the Loyal Toast had been honoured,

Alderman C. F. CRITCHLEY, J.P., C.C., proposed the toast of "The Mayor of Blackburn," in the course of which he said that

PRESENT AT THE INAUGURATION CEREMONY.

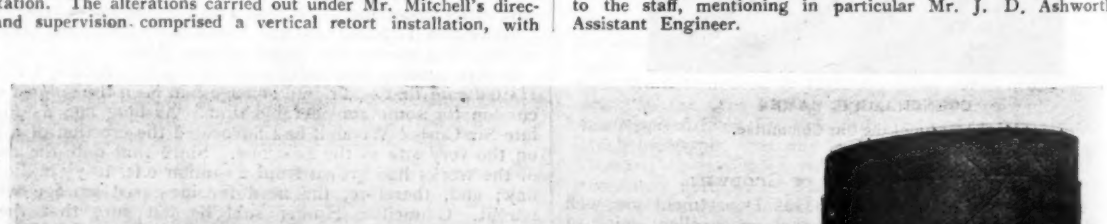
the honour of knighthood conferred upon Sir William Forrest was an honour not only to the recipient but also to the City of Blackburn.

Sir William Forrest in a brief reply, expressed his regret that he had been unable to inspect the works that morning. Whenever he visited them he always found something new of interest; and he was sure that had he been present at the inauguration ceremony he would have discovered several things redounding to the credit of their Engineer and General Manager, Mr. Mitchell.

A Tribute to the Gas Committee and Mr. Mitchell.

Alderman Fred West proposed "The Blackburn Corporation Gas Undertaking," coupled with the name of Councillor E. Hamer. After their inspection of the works, he felt that the toast required no commendation from him. In the gas-works the City of Blackburn had a most valuable asset. The works were a credit to the enterprise and foresight of the Gas Committee, and a monument to the skill of Mr. Mitchell. Between 1905 and 1925, the output of gas had practically doubled; and—what was even more noteworthy—since 1919 the increase had amounted to nearly 40 p.ct. This amply demonstrated that the gas undertaking at Blackburn was in the hands of a man of enterprise and foresight. Moreover, in the last twelve years, in spite of expenditure on new plant, the capital cost per million c.ft. of gas made had been reduced by 25 p.ct.—a figure which compared more than favourably with that relating to the gas industry in general. Blackburn was now supplying gas at a price which compared favourably with the charges of the largest municipal and company-owned undertakings in the land. Though last year the amount expended on new plant was considerable, gas was still supplied at no increased cost—a fact which reflected further credit on Mr. Mitchell. Alderman West referred to the excellent lay-out of the works, and the provision of tennis courts and other facilities for the workmen. To-day, progressive employers who desired to cultivate the proper relationship with their workmen must have regard to their social welfare. The Gas Committee of Blackburn certainly paid attention to this matter; and it would undoubtedly tend to good team work and the creation of that spirit which alone could result in success.

Councillor Hamer, replying to the toast, said he thought that his pride in the gas undertaking was justifiable. The credit, however, belonged not to him but to Mr. Mitchell, aided by a loyal staff and loyal workmen. Since the appointment of Mr. Mitchell, in 1919, the gas-works had undergone a complete transformation. Production activities had been centralized at the Greenbank Works, and the Addison Street Works remained only as a storage and distribution station. The alterations carried out under Mr. Mitchell's direction and supervision comprised a vertical retort installation, with coal and coke handling plant, of a capacity of 6 million c.ft. per day, complete with waste-heat boilers. Additional subsidiary plant such as exhausters, condensers, washers, purifiers, naphthalene washer, station meter, &c., had to be installed to meet the increased make of gas, which had risen from 2 million c.ft. to 6 millions per day. The cost of this had been met out of revenue. The new sulphate of ammonia plant, and the overhead hoppers and conveyors, together with the mechanics' shop, general stores, canteen for workmen, &c., were housed in buildings erected on the site of the old inclined retort house, and constructed of material taken therefrom. New roads had been formed throughout the works, thus assisting transport. The social life had not been forgotten; and bowling green, tennis courts, and football and cricket grounds had been laid out, and a suitable recreation room had been provided. The new plant which had been inaugurated that day completed the first section of a large scheme laid out by Mr. Mitchell, who had outlined further extensions to duplicate what they had seen. It was interesting that the total amount charged to capital account had only been £284,500, and that with the increased production of gas, the capital per million c.ft. made had been reduced from £805 in 1919-20 to £633 in 1925-26; the remainder being paid for out of revenue without increasing the price of gas. In fact, the price to-day was 1s. 1d. per 1000 c.ft. less than it was before the alterations were commenced. Work on distribution had proceeded with alacrity; and the whole organization had been re-modelled. A meter repair shop and cooker and general stores had been centralized at Greenbank; and with motor transport, everything was dealt with direct to the consumer. In 1921 he made a statement to the effect that £200,000 would have to be spent on enlarging mains and services during the ensuing ten years. In the past five years, 43,968 yards of main pipes had been laid (new and enlarged), and new and renewed services totalled 10,075 yards. The cost of this—all out of revenue account—amounted to £101,875, or approximately 5d. per 1000 c.ft. The policy adopted in this direction, together with the progressive sale of gas-consuming appliances, was reflected in the increased sale of gas. Since the year 1919 the increased output had been 230 million c.ft., equal to an annual increase in revenue at the present price of gas of £43,125. New showrooms were opened in June, 1925, and had proved a great asset to the Department. A maintenance scheme was now in operation whereby the consumer was assisted in keeping his apparatus at the highest efficiency. Blackburn, concluded Councillor Hamer, were very proud indeed of their Gas Engineer. Mr. Mitchell had been unwell lately, and all hoped he would have a speedy recovery to robust health. He (the speaker) would on this occasion like to pay a tribute to the staff, mentioning in particular Mr. J. D. Ashworth, the Assistant Engineer.



GENERAL VIEW OF THE WORKS.

EXCELLENT WORK OF THE CONTRACTORS.

Alderman SHARPLES, submitting the toast of "The Contractors," said that Messrs. Humphreys & Glasgow and Messrs. R. & J. Dempster were both firms pre-eminent in the gas industry, and both had world-wide reputations. Blackburn had been fortunate in securing them as contractors in the enlargement scheme at the Greenbank Works. Messrs. Humphreys & Glasgow were the original makers of carburetted water gas plant in this country; and the new plant erected at Blackburn had a capacity of 1¼ million c.ft. per day of 500 B.Th.U. gas. As for the 2 million holder, by Messrs. Dempster, this was essentially British; and he understood that there were at least 750 of this type in operation. The largest was at Belfast, and its capacity was 7 million c.ft. The holder at Blackburn had been fitted with the famous "Bearscot" specialities, and when inflated had a height of about 140 ft. They had all seen the splendid work that had been executed by the contractors; and the holder had the appearance of having been turned in a lathe. The steel tanks for both the 2 million holder and the relief holder, together with the foundations, had been carried out by Messrs. Dempster; and they in Blackburn congratulated themselves on the excellent work done by this firm and by Messrs. Humphreys & Glasgow.

PRESENTATIONS.

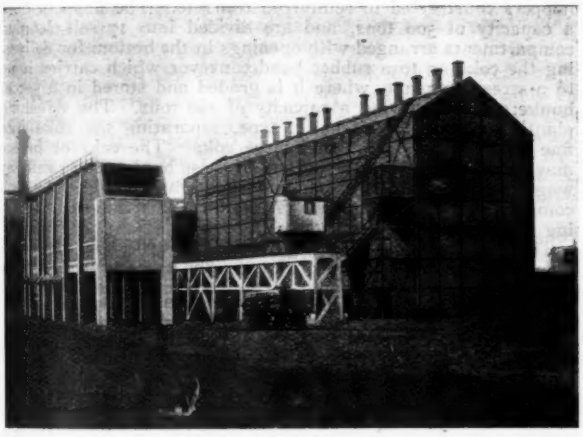
Mr. CHARLES DEMPSTER congratulated Blackburn on having such an excellent Engineer in Mr. Mitchell, in collaboration with whom, he said, it was a pleasure to work. He asked Councillor Hamer to accept a silver cigar box as a memento of the occasion of the inauguration of the new holder.

Councillor HAMER returned thanks for the gift.

Mr. W. G. HEAD replied to the toast on behalf of Messrs. Humphreys & Glasgow. Mr. Mitchell, he remarked, knew exactly what he wanted; and this facilitated the work of his firm as contractors. He had much pleasure in requesting Alderman Sharples to accept a silver salver.

Following Alderman SHARPLES' expression of thanks,

Councillor J. STANWORTH (Deputy Mayor) proposed the toast of "The Visitors." In doing so he expressed the opinion that gas fires



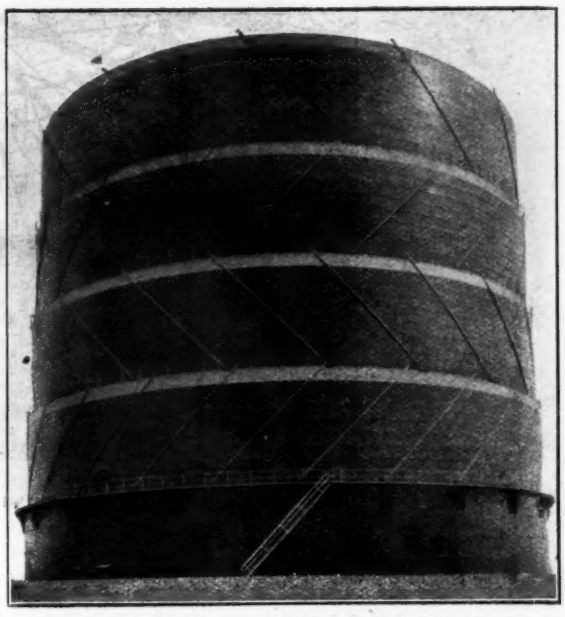
The Glover-West Verticals and the Coke Plant.

and cookers would be the greatest factor in the abolishment of the smoke evil.

COKE FOR THE OPEN FIREGRATE.

Alderman COOK (Chairman of the Manchester Gas Committee), replying to the toast, said that one of the greatest lessons of the recent coal strike was the purity of the atmosphere when less coal was being burned in the open firegrate. The Medical Officer of Health for Manchester had given him statistics relating to the decrease in the death rate in that town for the period May to December, 1926, compared with the corresponding period of the previous year. This decrease was 11·4 per 1000; and undoubtedly one of the factors which had brought about this was the greater purity of the atmosphere. Regarding the installation of gas fires, the industry was doing well in connection with new housing schemes. In most of these, however, there was provision for one open fire; and it was to this that he desired to direct attention. Gas undertakings were the purveyors of a solid smokeless fuel, coke; and if each concern would set its house in order, and supply a good coke, people would soon employ it in the open firegrate. Its use would benefit the gas industry, and would be a real blessing to the community.

Mr. W. B. MCLUSKY, of Halifax, who also replied on behalf of the visitors, remarked that he had watched with interest the work which Mr. Mitchell had carried out; and what had impressed him more than anything else was the large amount of work which had been accomplished in such a short time. Many engineers had at various periods during their careers carried out reconstructions; but in half-a-dozen years Mr. Mitchell had undertaken what might be regarded as a lifetime's work. The remarkable increase in business was indicative of the consumers' appreciation of what had been done for them. The low capital charge, which was reflected in the low price of gas, was a credit to Mr. Mitchell. After all, the only thing about which the consumer worried was the gas bill. A large proportion of the extension costs had been paid for out of revenue. This, said Mr. McLusky, was an admirable policy. During the period the Corporation had been engaged in altering the gas-works, they had not neglected their consumers; they had borne in mind that gas was useful only at the point of ignition. It was no use manufacturing gas efficiently if it could not be utilized with satisfaction. He had no doubt that the output of gas by the Blackburn Gas Department would become greater and greater as time went on.



The New Two-Million Holder.

Councillor HAMER said that doubtless those present would have liked to hear something from Mr. Mitchell. As, however, Mr. Mitchell had only just recovered from an attack of influenza, he had asked him to thank them on his behalf.

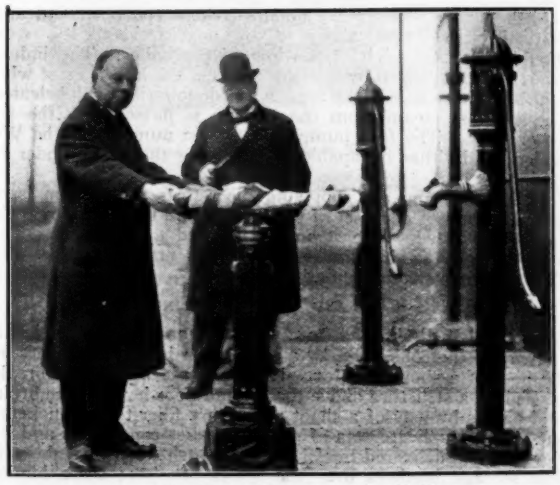
An illustrated brochure was prepared for the occasion; and from this we take the following extracts.

THE BLACKBURN GAS DEPARTMENT.

When the Corporation purchased the gas-works from the Blackburn Gas Light Company, the annual output was about 315 million c.ft. In 1880, the gas made amounted to 331 million c.ft., while last year it was practically 1165 millions. As indicative of the great improvement which has taken place in the practice of gas-making, it may be mentioned that, though the price per 1000 c.ft. was the same in 1880 as in 1926—3s. 9d.—the cost of coal per ton in 1880 was 10s. 11d. compared with 25s. 6d. in the financial year ended March 31, 1926, and with 40s. 6d. in the year Jan.-Dec., 1926.

THE GREENBANK WORKS.

In 1900, the Greenbank Works were opened on a site giving ample room for the erection of extensive gas-making plant, and in direct communication with the main line of the then London & North Western Railway, which runs alongside. The first carbonizing plant consisted of an inclined retort bench of ten settings, to which an extension of eleven settings was added ten years later; the total capacity being 2 million c.ft. per day. These inclined retorts were recently demolished, and the building was reduced in height, re-roofed, and divided so as to house a new sulphate plant and store, mechanics' and blacksmiths' shops, general and cooker stores, and cooker repair shops, together with mess room and wash-house.



Councillor Hamer Inaugurates the Holder.

THE ROOF FRAMING UNDER CONSTRUCTION.

VERTICAL RETORTS.

Before the end of the war, it was evident that further carbonizing plant would be necessary, so an installation of Glover-West vertical retorts of a nominal capacity of 3 million c.ft. a day, together with coal and coke handling plant, were erected in 1919-20.

The rapid increase in the gas consumption by 1924 again brought to the fore the question of additional carbonizing plant; and a contract was placed with West's Gas Improvement Company to reconstruct the existing vertical settings to a nominal capacity of 6 million c.ft. per diem, and instal waste-heat boilers. The installation now consists of 96 retorts arranged in two benches of six settings each. The retorts, which are elliptical in shape, are built up of tongued and grooved segments, having a taper from top to bottom to ensure an even and constant descent of the charge, with minimum wear on the sides of the retorts. The retorts are 2 ft. 9 in. by 10 in. at the top, and 3 ft. 3 in. diameter at the bottom, having a total length of 24 ft.

WASTE HEAT RECOVERY.

Six beds of one bench are equipped with a battery of waste-heat boilers of the Galloway tube type, and each boiler is complete with by-pass arrangement, so that the waste gases may be directed either through the boiler or into the chimney, by closing or opening the respective dampers. Each boiler is fitted up with its own superheater, is capable of evaporating 750 lbs. of water per hour to a pressure of 100 to 120 lbs. per sq. in., and is fitted with a "Thermofeed" regulator and a "Hilo" water level alarm, manufactured by Ronald Trist, Ltd. Two feed-water pumps, one of the steam driven Weir design, and the other electrically driven, are provided.

The other retort bench, containing six beds, is equipped with one Kirke waste-heat boiler constructed by Spencer-Bonecourt, Ltd., on the induced draught, firetube principle.

The waste gases from the settings are fed into a common flue; each setting being provided with by-pass arrangement, so that the waste gases may be directed into the common flue, or into the chimney. The Spencer-Bonecourt boiler is capable of evaporating 7000 lbs. of water per hour. The steam passes to a set of superheater tubes arranged for indirect heating in the inlet products box. The boiler is equipped with a "Thermo-feed" regulator and a "Hilo" water-level alarm similar to those on the other waste-heat boilers. This apparatus ensures that the water level in the boilers is kept constant, and automatically gives the alarm if by any accident the water should stand too high or too low in the boiler. The induced draught fan is driven by a steam turbine, the impellers of which run in water-cooled bearings with double-ringed lubricators. The exhaust steam from the turbine is passed into the feed water tank. The feed pumps are two in number, of the Weir design, and either is capable of supplying the boiler under full load.

The main range for supplying the retorts with steam is run to the bottom of each set of benches, where two Aulds reducing valves are fitted. The steam is supplied to the retorts at 10 to 20 lbs. per sq. in., and each retort is fitted with the West-Taylor patent steam regulating valve.

COAL AND COKE HANDLING.

The coal is discharged from wagons, running on the elevated railway of the coal store, by a set of twin hydraulic tippers into the boot of a short elevator. It is delivered into a coal breaker carried on a structure above the ground floor level. The broken coal passes by way of a shoot and rotary filler to the buckets of one of the duplicate sets of gravity-bucket conveyors, and it is elevated and delivered to either of the push conveyors above the coal storage bunkers over the retort benches; these bunkers having a capacity equal to 48 hours' supply.

The coke is discharged from the chambers into skips below the retorts, and is picked up by a steam locomotive crane capable of lifting a gross load of 2 tons at a radius of 35 ft., with slewing, travelling, and derricking motions. A portion of the coke is discharged by the crane into overhead steel hoppers attached to the side of the retort house, from which a supply is conveyed to the producers in suspended skips travelling on ball-bearing carriages on an overhead runway.

The coke for sale is discharged by the crane into a battery of hoppers constructed in reinforced concrete. The hoppers have a capacity of 500 tons, and are divided into 17 self-cleaning compartments arranged with openings in the bottom for delivering the coke on to a rubber band conveyor which carries it up to a screening plant, where it is graded and stored in a set of bunkers below, having a capacity of 100 tons. The screening plant is of the "Whitehall" type, separating the coke into fine breeze, 1 in., 2 in., and large coke. The coke or breeze may be delivered from the bottom of these bunkers into railway wagons or vehicles, and bagging shoots are provided to each compartment of the bunkers. A platform is arranged for loading the bags on motor wagons.

The coal handling machinery, coke conveyor, and screening plant are driven by electric motors; the current being taken from the Corporation supply. The coke extractors are driven by one of two gas engines.

CONDENSERS, EXHAUSTERS, AND PURIFYING PLANT.

The condensing plant consists of four cylindrical towers of the water-tube type, and has a nominal capacity of 4 million c.ft. of gas per day. There are also two batteries of atmospheric condensers, and two square cast-iron water-tube tower condensers. The exhauster house contains one Bryan-Donkin machine of a capacity of 250,000 c.ft. per hour, and two sets of Waller exhausters—one of a nominal capacity of 150,000 c.ft. per hour, and the other of 80,000 c.ft. All these sets are driven by steam engines.

The wet purification plant is located in the open, and comprises two Livesey washers for the extraction of the tar, one of which has a capacity of 2 million c.ft. per day, and the other of 4 millions. The ammonia washing plant consists of two twin sets of Holmes rotary washer-scrubbers, each of a daily capacity of 4 million c.ft.

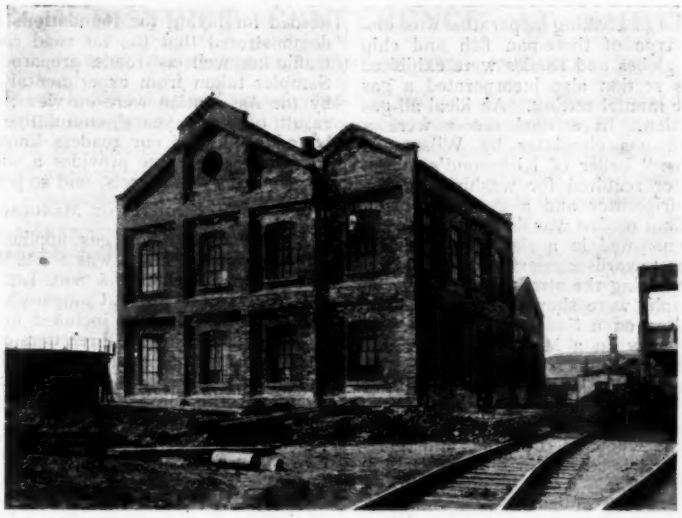
The purifier house contains eight purifiers, each 35 ft. square by 6 ft. deep, with luteless lids. These are carried upon a superstructure; the spent oxide being discharged through bottom doors to the revivifying floor below. Duplicate elevators and band conveyors driven by a gas engine are provided for filling the boxes with oxide. Two 24-in. Weck valves control the working of each set of four purifiers. Another set of four boxes has recently been erected, each 35 ft. square.

There is a naphthalene washer of a capacity of 4 million c.ft. per day, so arranged that a duplicate washer may be put down at some future date, and be driven by the same steam engine, to form a complete unit capable of dealing with 8 million c.ft. daily.

TWO-MILLION SPIRAL-GUIDED HOLDER.

This rests on a concrete raft laid about 8 ft. below the ground level. The steel tank is 159 ft. 6 in. diameter by 30 ft. 4 in. deep, housing a four-lift holder of the following dimensions: Outer lift 157 ft. diameter, second 151 ft., third 15[illegible] ft. and inner 148 ft.; all being 29 ft. 6 in. deep. The crown has a rise of 8 ft. 9 in. from curb to centre. The inner lift is weighted to give 6½ in. pressure; the total pressure of the four lifts being 14 in.

The upper edge of the top row of side plates of the various lifts is extended above the curb and dips, to protect the painting; while suitable handrails and stands are fixed around each dip, crown, and the tank balcony. The guide rollers are of the "Bearscot" all-steel four-roller type embodying the latest im-



THE C.W.G. HOUSE.

provements in lubrication, and the dip carriage rollers are all linked in pairs. The lifts are fitted with run-down stops, and the cups are provided with anti-freezers; and ladders are fixed to each lift, with a staircase from the ground line to the tank balcony.

The contractors for the steel tank, gasholder, and foundations were Messrs. R. & J. Dempster, Ltd., of Manchester, and the same firm also carried out the contract for the telescopic spiral gasholder and steel tank containing 75,000 c.ft., operating as a relief holder for the water gas plant.

CARBURETTED WATER GAS PLANT.

This comprises one section of Humphreys & Glasgow carburetted water gas plant having a daily capacity of about 1,250,000 c.ft. of 500 B.Th.U. gas. The plant is equipped for the operation of the Young-Whitwell three-phase cycle "back-run" process, which has been extensively adopted in America, and is arranged so that a waste-heat boiler and self-clinkering generator can be conveniently installed in the future.

The generator house is constructed of steel framework with brick panels and pilasters. In this building provision is made for adding a duplicate water gas set at some future date; and the necessary steel girders and stanchions have been provided with a view to installing overhead coke storage hoppers and telpher plant for feeding the generators. The plant is complete with water-tube condenser, oil storage tank, tar separator, and a relief gasholder of 75,000 c.ft. capacity, in a steel tank.

Adjoining the generator house is situated the water gas machinery house. This contains duplicate direct-coupled steam turbine blowers and a steam-driven Waller exhauster of 50,000 c.ft. per hour capacity. Outside the generator house there are a Livesey washer and a tangential dryer, after passing through which the gas is led to the purifiers.

SULPHATE OF AMMONIA PLANT.

This plant is one of R. & J. Dempster's latest design, representing the most modern practice in manufacturing neutral sulphate. It is capable of making 4 tons of neutral salt per day. The storage, bagging, and weighing plant is in an adjoining building. The plant comprises twin superheaters, still, lime mixing tanks, with the saturator on a raised staging. The sulphate is ejected upon a primary draining table, from which it is delivered into a centrifugal machine having a bottom discharge leading to a steam-jacketed dryer. The ammonia gases from the still are passed through the dryer, and the surplus is returned after neutralizing the salt. The dried salt is automatically discharged into an elevator boot, raised and deposited upon a belt conveyor fixed over the storage hoppers in the adjacent building, and is discharged into overhead steel bunkers of a capacity of 135 tons. These bunkers are fitted with bottom discharge doors, through which the sulphate passes to an Avery automatic weighing and bagging machine. The floors of these buildings are 3 ft. 8 in. above the railway alongside, to facilitate loading into railway vans.

TAR DISTILLATION PLANT.

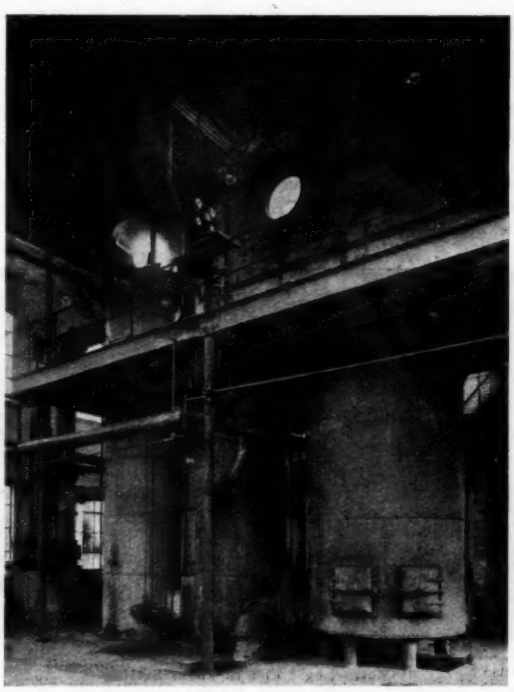
There is a Hird complete tar distillation plant capable of dealing with 30 tons of crude tar per day, and producing four fractions of oil and pitch. The receivers and storage tanks, with pitch bays, are arranged within easy access of the railway. Steam for the plant is obtained from a Lancashire boiler fixed at the site.

The works are provided with a well-equipped laboratory, and are well served by siding and railway accommodation.

ADDISON STREET WORKS.

These works are now closed-down for gas-making purposes, and are used as a storage and distributing station only. There are three holders, of capacities of 3 million c.ft., 600,000 c.ft., and 500,000 c.ft. Two station governors are installed for regulating the pressure to the district, and two Terry steam turbine boosters, of a capacity of 250,000 c.ft. per hour, draw the gas from the Greenbank Works. There is also installed a gas-driven high-pressure set of 20,000 c.ft. per hour, for distributing the gas through an independent steel main at a pressure of 5 lbs. per sq. in. to an outlying district. This serves high-pressure street lights and shop lamps fixed in the centre of the town.

The Grimshaw Park Station is used for a storage station only. There is one holder of a capacity of 600,000 c.ft.



Humphreys and Glasgow C W.G. Plant.

SMOKE ABATEMENT EXHIBITION.

After the luncheon, the visitors were conveyed to the Drill Hall, where a most attractive exhibition of gas appliances was staged. The opening ceremony was performed by Alderman F. S. PHILLIPS, Chairman of the Salford Gas Committee.

What impressed us at once on entering the Hall was the uniformity of the whole display—an effect difficult of accomplishment when the items exhibited are heterogeneous. The stands were of uniform height, and purple was the background colour of them all. The avenues between were wide, and gave a pleasing air of spaciousness to the exhibition. The whole of the work in connection with the erection of the stands, &c., was carried out by the Gas Department themselves. Their exhibit, which naturally occupied a good deal of space, was divided into

four sections. In the first, large cooking apparatus was displayed, including the latest type of three-pan fish and chip range. In the next, various globes and shades were exhibited to great advantage, and this section also incorporated a gas fire in a particularly attractive mantel setting. An ideal all-gas kitchen formed another section. In a tiled recess were a cooker, a fire, and a small gas circulator by Wilsons & Mathiesons. Nearby, a "Lyn" boiler of Richmond's manufacture supplied the hot water required for washing-up purposes. An "Electrolux" refrigerator and a gas wash-boiler completed the scheme. The final section was devoted to general propaganda work, and demonstrated in a clear manner how greatly the gas industry helps towards conserving the coal resources of the country and purifying the atmosphere. Regarding the latter point, photographs were shown of an industrial town. One of these was taken on a Sunday, at noon. The other two were of the same view on a Monday at noon and at 4.45 p.m. At the latter time, practically nothing was discernible. Regarding the conservation of coal, a cube painted black and white symbolized the heat units in 35 million tons of coal. The black portion, connected by ribbons to ashes and soot, constituted practically the whole of the cube, and represented the loss of heat when coal is burned in the raw state in the open firegrate. The white portion—a very small percentage of the whole—indicated the quantity of heat actually utilized. A chunk of coal was connected by ribbons to the various bye-products of carbonization, and emphasized that the treatment of coal by the gas-works process is not merely desirable, but essential, if Great Britain does not wish to squander her natural wealth.

The Gas Department also showed the public the efficiency of gas cooking. Each afternoon and evening cookery demonstrations were given by Miss Jessie Brownlie.

Tar for Roads.

The British Road Tar Association had a stand which took the form of a combined exhibit and information bureau. The initial cost of tar and suitable aggregate is low; and as about £40,000,000 is being spent every year on the roads of Great Britain, this is of importance. Tarmacadam is also inexpensive to lay, and requires no skilled labour. No involved process is needed for laying the foundations. The exhibits on the stand demonstrated that the tar road can stand up to weather and traffic as well as roads prepared with any other material. Samples taken from experimental sections of road carried out by the Association were on view; and one exhibit showed the result of seven years' cumulative tar surfacing of a water-bound road. As our readers know, tarmacadam mixed with a suitable aggregate provides a surface just sufficiently rough to grip tyres and wheels, and so prevent skidding.

Exhibits of Manufacturing Firms.

Several well-known gas appliance manufacturers exhibited their products. There was a fine display of geysers of all sizes and patterns by Ewart & Son, Ltd., who had models working. The Parkinson Stove Company's stand was shared by W. Parkinson & Co., who included in their display a "No. 802" street lamp containing three tiers of inverted mantles—fourteen in all, arranged 8, 4, and 2. Another large street lighting unit shown was an example of the "1200" series, U fixing; the mantles in this lamp being arranged in two tiers. Illumination of the stand was by lamps suitable for shop lighting. Cookers, fires, wash-boilers, &c., were attractively displayed by the Parkinson Stove Company, John Wright & Co., R. & A. Main, Ltd., the Davis Gas Stove Company, Cannon Iron Foundries, Ltd., and William Sugg, Ltd. The latter firm made a feature of their new concave gas fire, which has been fully described previously in the "Journal," and which gives excellent results. General Gas Appliances, Ltd., also had a good exhibit; their grey enamel and white tiled cookers being most attractive. A brilliant show of shades and fittings was made by Falk, Stadelmann & Co., Ltd.; and the Thermal Syndicate, Ltd., demonstrated the remarkable heat-resisting qualities of "Vitreosil" globes. The application of gas to steam raising was exemplified by Spencer-Bonecourt, Ltd.; and a local firm—Reynolds & Co.—featured their "Reliable" circulating and spraying wash-boiler.

The Band of H.M. Royal Marines was in attendance.

Altogether the exhibition proved thoroughly interesting, and it ought to repay—and doubtless will more than repay—the Gas Department for their work and the expense entailed in connection with it.

MORE VIEWS FROM OLYMPIA.

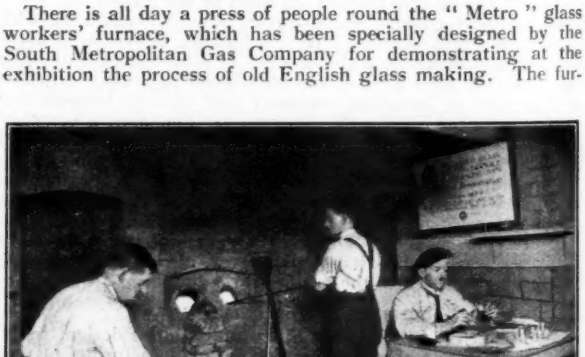
The Ideal Home Exhibition at Olympia is still drawing its crowds of admiring visitors, who find in it a number of arresting features. Some have already been illustrated in the "Journal;" and to these we are now able to make addition.

The stand of Associated Crafts, Ltd., shows a room panelled in Dekart oak, with rich fittings. There is an ingle-nook with

"Metro-Log" Fire in Tudor Setting.

carved Tudor-design arch, and quaint oak seats; and in the centre, peculiarly appropriate to its surroundings, is a large "Metro-Log" gas fire of the South Metropolitan Gas Company. This fire is not of the standard size, but was specially made for its handsome fireplace. The fire is carried in a basket; and no one who had not been previously informed would guess the source of the cheerful flames.

There is all day a press of people round the "Metro" glass workers' furnace, which has been specially designed by the South Metropolitan Gas Company for demonstrating at the exhibition the process of old English glass making. The fur-



"Metro" Glassworkers' Furnace.

nace contains two pots—one for clear and the other for coloured "metal," as the molten glass is termed. The working temperature of the molten glass is approximately 1075° C.; but so effectively is the furnace insulated, that it is possible to place the naked hand on its exterior surface without being inconvenienced in any way. The gas is supplied to the furnace under ordinary pressure.

Gas for Varnish Making.—Varnish manufacture involves a series of delicate operations which are unknown to the average man in the street. Varnishes are not prepared by simply mixing two or three ingredients, but are the result of a careful selection of gums and oils, their scientific blending at certain temperatures, and the subsequent maturing of the product over periods extending to years in some cases. The current issue (No. 156) of "A Thousand-and-One Uses for Gas" gives some useful information on the manufacture of varnish in the world's largest varnish factory, and contains excellent illustrations which will be of general interest to property owners. It will be of particular interest to the varnish manufacturer, as it includes full details (accompanied by scale drawings) of modern types of gas-fired plant.

"B.C.G.A." DISTRICT CONFERENCE AT SMETHWICK.

THE INDUSTRIAL SIDE OF THE INDUSTRY.

TAKING place in an industrial area, it was appropriate that the British Commercial Gas Association Midlands District Conference, which was held on Wednesday last at Smethwick, should be mainly devoted to consideration of the industrial side of the business. Both the morning's visit and the afternoon's business session afforded striking evidence of the advantages of gas as a fuel in manufacturing operations —advantages which offer the industry an unlimited field for expansion.

There was in the morning a large gathering of engineers of gas undertakings in the Midlands and others in the Council House, Smethwick, where they were cordially received by his Worship the Mayor (Councillor Frank H. Jones, J.P.) and the Mayoress. They were also warmly welcomed by Alderman C. W. Pinkney (the Chairman of the Borough of Smethwick Gas Committee) and Mr. E. Hardiker (the Gas Engineer and Manager). Mr. W. M. Mason, the Manager of the "B.C.G.A.," was there; and so was Sir Arthur Duckham, together with Alderman J. H. Lloyd (the Chairman of the Birmingham Corporation Gas Committee) and Mr. F. C. Briggs (the President of the Midland Association of Gas Engineers and Managers). Many friends were pleased, also, to meet once more Mr. Vincent Hughes, who for a period of twenty years was in charge of the Smethwick Gas-Works.

ALUMINIUM CASTING BY GAS.

Smethwick can claim to be the birthplace of British engineering, as it was within its boundaries that the first successful steam engine was built by Matthew Boulton to the design of James Watt. There are within the borough many important industrial undertakings; and one of these—the Birmingham Aluminium Casting (1903) Company, Ltd., in Dartmouth Road —was visited on Wednesday. Here the party were received by Mr. Frank W. Gower (the Managing Director), and found themselves in light and airy factories, equipped on the most modern lines. The Company, which is the largest of its kind in Europe, is engaged for the most part in the manufacture of castings for the automobile industry; and these castings are produced both in sand and in metal moulds—the latter by the Cothias process of die casting. The comfort of the workpeople is carefully considered. Large playing grounds are provided adjoining the works, and there is even apparatus for administering violet ray treatment, of which every man may avail himself if he desires. The buildings cover over 7 acres, and the employees number 2000.

The particular reason for the visit of the British Commercial Gas Association to the works was, it may be remarked, that the Company are pioneers in the use of gas for melting aluminium on a large scale. Some idea of the extent of the operations will be formed when it is borne in mind that, although it is not the only fuel used, the consumption of gas is over 160 million c.ft. per annum. Millions of castings are made each year; the weights ranging from ½ oz. to 800 lbs.

LUNCHEON.

After the visit, there was luncheon at the Smethwick Municipal College, by invitation of the Chairman and members of the County Borough of Smethwick Gas Committee. The MAYOR presided; and among those present were Lady Cynthia Mosley and the Mayoress of West Bromwich (Mrs. Grace Cottrell). A little speech-making followed. After the Loyal Toast,

HISTORY OF GAS IN SMETHWICK.

Alderman J. H. LLOYD, J.P. (the Chairman of the Birmingham Corporation Gas Department), said it was a great pleasure to attend on behalf of the city of Birmingham, who desired to associate themselves with this gathering. He congratulated Smethwick upon having this "Clean Air Week." The whole neighbourhood, from Castle Bromwich to West Bromwich, seemed to have been specially active in this connection during the past month, which included the holding of the British Industries Fair. It was not yet generally realized how much the gas and electrical industries did towards the cleansing of the air, though as time went on the knowledge was spreading. Smethwick had always done its full share in this direction, and had been prominent in the history of gas lighting for over a hundred years. It was in the year 1802 that Murdoch illuminated with gas part of Soho Foundry, to celebrate the Peace of Amiens. Originally Smethwick formed part of the district supplied by the Birmingham and Staffordshire Gas Light Company, which covered an exceedingly large area—20 miles from north to south, and 16 from east to west. In 1875, the powers of this Company were purchased by the Birmingham Corporation; but a clause was inserted in the Act to enable the outlying districts (subject to arbitration) to erect works for themselves. Smethwick (together with West Bromwich, Oldbury, and Tipton) availed themselves of this privilege; and their works were opened by Mr. Arthur Keen, Chairman of the then Local Board, on October 1, 1881. It was interesting to know that, though Smethwick had increased its annual output since 1882 by 738 million c.ft., and Birmingham by 2525 millions, the percentage of increase was greater at Smethwick; being nearly seven times as much, whereas the output at Birmingham was not quite five times greater than it was in 1882. The population of Smethwick was a little over three times as great as in 1882, so that the consumption of gas per head had increased twice as fast as the population. The gas used for domestic purposes now averaged over 30,000 c.ft. per consumer per annum; while the quantity of gas made per ton of coal had risen from 10,162 c.ft. in 1882 to 17,425 c.ft. To keep up with the increase in consumption at Smethwick, extensions and remodelling had been, and still were, continually taking place; but through the whole period, there had only been three engineers—the late Mr. B. W. Smith (afterwards of Walsall), Mr. Vincent Hughes (for twenty years), and now Mr. Ernest Hardiker, who came to Smethwick in 1920.

A UNITED INDUSTRY.

Last week some of those present had had the pleasure of meeting at the dinner given to Sir David Milne-Watson, in recognition of his knighthood and his services to the gas industry. It was remarkable to recall that a few years ago the industry had no National Gas Council, no British Commercial Gas Association, and no Federation of Gas Employers or Joint Industrial Council. At that dinner, an optimistic view of the future was expressed by the speakers, notwithstanding the competition to which they were all subjected. The last year had been a terrible one for all of them in the gas industry, as well as for the people generally, on account of the coal dispute. It had been said, with a great amount of truth, that gas saved the country from starvation. What was starvation? It was defined as "a suffering extremely from cold or want of food." Gas cooked their food, and coke baked their bread. How could many a home have obtained even a cup of tea without gas? Years ago each gasworks was a law unto itself, and took no interest in its neighbours. To-day they were united, and desirous to help each other in any way they could. By thus joining together they adopted the most efficient means to give the best service, and by research to find out where improvements could be introduced or economies effected. But it must always be remembered that the strength of a chain was its weakest link; and if any gas company or department was content with slipshod management or careless attention to customers, such undertaking injured not only itself, but the whole industry. Thus it was to the interest of all to induce every undertaking to do its best. Much more scientific knowledge and research was being applied to all branches of the industry; and it was essential that they should all keep up to date, and give the best service possible to the community. The friendship of Birmingham with Smethwick was a very pleasant one; and in proposing the toast of "The County Borough of Smethwick Gas Department," he wished the undertaking every prosperity.

The reply was by Alderman GEORGE BEST, J.P., who said there had been witnessed a wonderful transformation of the gas industry in that neighbourhood under the guidance and chairmanship of Councillor S. W. B. Stephen and Alderman C. W. Pinkney, J.P. They were very proud of their gas-works, which were a credit to Mr. Hardiker. In saying this, he did not wish to forget those who had gone before. Mr. Smith and Mr. Hughes had both given splendid service in their time. They must, however, bring down the price of gas, so as to keep out other fuels.

THE GAS INDUSTRY.

The MAYOR proposed the toast of "The Gas Industry," and said that, when they compared their own comparatively small undertaking with those whose output was very much larger, they found that Smethwick occupied a very good position in the matter of the price charged to the consumer. The industry strove to give the best possible service, and this was the reason for its progress. In Smethwick they had a competent staff of workmen to visit the houses of consumers, and see that the appliances were maintained in a first-rate state of efficiency. The power and usefulness of advertising was now fully realized by the industry. With regard to the coal strike, so far as the gas industry was concerned he felt that out of evil would come good. Many people during that period had been forced to use gas appliances, which, having once experienced their advantages, they would certainly not give up. In this connection, he would like to pay a high tribute to everyone connected with the gas industry. Officials had displayed a wonderful amount of resource, and the workers had carried out their duties with extreme loyalty. Perhaps he might be permitted to remind those present of a few facts—doubtless familiar to some—which indicated the magnitude of the industry in which they were engaged. Of coke and breeze 10 million tons were produced annually, of which 9 million tons were consumed at home for industrial and domestic purposes. Tar to the extent of 172 million gallons was made annually; and, of course, a great quantity of sulphate of ammonia. Over 18 million tons of coal were consumed in Great Britain last year in the production of some 285,000 million c.ft. of gas. The capital now invested in the industry exceeded £160,000,000. More than 100,000 men found employment, and a sum of £15,000,000 was paid annually in wages and salaries. It was interesting to note that a large percentage of those so employed participated in schemes of co-partnership. It was estimated that 36 million people in this country were using gas supplied to them through 8 million meters. In comparing the figures of recent years, one was struck by the progress and expansion that had taken place, and the marked advance in efficiency in the carbonization of coal, as shown by the increased number of therms produced per ton. This increased efficiency had been largely brought about by successful research work undertaken by the industry. The great importance of research, and yet still further research, was obvious

to all. Coal was a rapidly diminishing asset; and it was imperative that it should be utilized in the most scientific and economical manner possible.

Going for Cheapness.

Sir Arthur Duckham, K.C.B., said this was a toast to which he was proud to reply. It was to the gas industry that they must in the future to a great extent look for the conservation of the country's coal supplies and the prevention of smoke. The gas industry was essentially the provider of smokeless fuel, whether in the form of gas or of coke; and one thing he wished to get into the minds of everybody was that the gas industry could only grow by providing these fuels first in a satisfactory state, and secondly at a cheap rate. It was cheapness that the gas industry was going for. They could not get an increased consumption unless they sold their gas; and this could only be done by its being offered at a cheap rate. The cheaper it became, the more gas could be used; and this was the only way in which gas undertakings could make more money. They heard to-day a good deal of talk about the competition of gas and electricity; but essentially they went forward hand in hand. He had been informed that Birmingham had the largest consumption of gas per capita in this country; but he believed the amount was still larger in Chicago, New York, and San Francisco—where the ordinary person would say that electricity was employed for every purpose. The fact was, however, that as electricity advanced, so did gas. The whole idea of the gas industry was service—without which it could not develop. There was a great future for the industry; and young men who were seeking careers in a really useful industry should give it their attention. It was full of interest; and there were fine openings, with plenty of scope, for the right type of young fellow. He appealed to all to do their part in providing for the industry the men that it would require in the future.

Alderman C. W. Pinkney voiced the thanks of all present to the Mayor for spending so much time with them and presiding at the luncheon.

Alderman Pinkney on the Situation.

In the afternoon there was a public conference in the Municipal College, presided over by Alderman C. W. Pinkney, the Chairman of the Smethwick Gas Committee.

Alderman Pinkney said he desired in the first place to congratulate gas engineers on the remarkable progress they had made during the past twenty years. The research work which had been accomplished had had much to do with this progress. Each engineer could proceed on the lines which he believed would lead in his own particular case to economy and efficiency; and in doing this, he should be encouraged. The way he took might be a strange way. Along that way, there might be a notice "No road;" and he might have to turn back for a time. But what did this matter? He could change his course, and then go ahead again. He wanted to say that gas committees and directors were not hard-hearted. They were sufficiently intelligent to understand that sympathetic consideration must be given to their engineers. He had been asking himself what the industry would have done without the Institution of Gas Engineers, and where they would have been at the present moment had it not been for the assistance of the British Commercial Gas Association. He well remembered the birth of the latter organization, which, under the control of Mr. F. W. Goodenough, Mr. W. M. Mason, and a first-rate staff, had done excellent work.

The following paper was then read:

INDUSTRIAL HEATING BY TOWN GAS: ITS ADVANTAGES AND ITS RELATION TO THE CONSERVATION OF FUEL.

By C. M. Walter, D.Sc., Engineer-in-Charge, Industrial Research Laboratory, Birmingham Gas Department.

It is only, perhaps, of recent years that manufacturers have turned their attention to the possible economies which might be effected by the employment of industrial heating apparatus of improved design in their works, and, further, that they have fully realized the considerable advantages to be gained by the use of gas in place of solid fuel.

It has often happened that, when contemplating the installation of new plant, more attention has been given to the question of fuel cost alone, without taking into account the considerable savings which can be effected indirectly by the utilization of gaseous fuel. In order to show the savings which can be indirectly effected by the use of town gas, as compared with solid fuel, in many operations of heating, I shall, later on, quote typical examples, from which it will be noted that the indirect savings will, in many instances, easily outweigh the increased fuel cost which may be involved by the use of gas, as compared with solid fuel. There are obviously many instances where the fuel cost alone is the prime cost; and in such cases it is essential that the application of gas as a fuel should justify itself, on a fuel cost basis alone. In many instances, gas furnaces have been found to accomplish this, although on a B.Th.U. basis the fuel cost may be considerably higher in the case of town gas than with solid fuel.

In such cases, the lower fuel operating cost of the gas-heated furnace is due to the higher efficiency of utilization of the fuel; and, as an example, I might mention the simple case of the small direct-fired gas-heated oven furnace which is now employed to a considerable extent in the workshops of our factories for annealing, heat-treatment, and similar heating operations. Where in the past solid fuel had been used for carrying out these intermittent operations of heating, the efficiencies obtained were extraordinarily low—rarely exceeding 5 p.ct.—the amount of fuel consumed in the preliminary operation of heating-up the furnace being abnormally high. Thus the fuel cost for the complete operation was considerably higher than that which would have obtained if a low thermal capacity, well-designed, gas-heated furnace were used, in which case efficiencies as high as 15 to 20 p.ct. could be readily obtained, with a total fuel consumption considerably less than in the case of the solid fuel fired furnace.

Some of the indirect economies to be effected by the employment of town gas as an industrial fuel are tabulated below:

1. Reduction in the amount of labour required for operation.
2. Ease of manipulation.
3. Flexibility of control of temperature and evenness of heating.
4. Improved quality of product.
5. Saving of floor space by the heating unit itself, and also by the elimination of storage accommodation for solid fuel.
6. Low maintenance cost.
7. The existence of better working conditions for the operator.
8. Elimination of expenses incurred in removing ashes.
9. Ease with which fuel can be metered for costing purposes.
10. Adaptability to automatic methods of control.

These, while constituting some of the more important advantages to be obtained by the use of gas, can be amplified very largely according to the particular process under consideration; but it is generally found that the advantages mentioned above, taken in combination, are sufficient to justify the use of town gas for the bulk of the operations of heat-treatment, annealing, hardening, and tempering which are so extensively conducted in the factories and workshops of our industrial centres.

After having set out in general terms many of the economies to be obtained by the use of town gas as an industrial fuel, I now propose, before dealing with certain applications in detail, to refer to the amount of town gas supplied by the City of Birmingham Gas Department for industrial heating purposes, and, incidentally, to indicate the rate at which the output of gas for this purpose has increased during the last fifteen years.

Table I.

Year Ending March 31.	Total Gas Sold.	Total Industrial.*	Industrial, P Ct. of Total.
1911	7,693,899,300	389,511,000	5·06
1913	8,773,044,600	609,424,800	6·95
1914	9,551,783,300	793,840,400	8·31
1915	9,887,664,900	905,271,000	9·16
1916	10,796,405,600	1,496,742,100	13·86
1917	11,156,832,900	2,216,048,400	19·86
1918	12,006,496,700	2,680,489,200	22·33
1919	11,424,842,000	2,522,338,600	22·08
1920	11,329,113,800	1,910,643,600	16·86
1921	11,734,970,300	2,005,839,200	17·09
1922	10,264,218,300	1,345,637,300	13·11
1923	10,937,923,300	1,665,257,100	15·22
1924	12,017,086,400	2,057,283,000	17·12
1925	12,659,612,900	2,309,976,800	18·25
1926	13,389,831,100	2,643,998,600	19·74
Nine months to Christmas, 1926	9,413,115,400	1,883,284,400	20·01

* The output of gas under the heading "Total Industrial" does not include gas used for motive power.

The above tabulation shows the total amount of gas sold by the City of Birmingham Gas Department for the fifteen years ending March 31, 1926, and also for the nine months ending Christmas, 1926. In column 3 the amount of gas supplied for industrial heating purposes alone, apart from that used for motive power, is set out; and in column 4 this consumption is indicated as a percentage of the total gas supplied.

It is interesting to note that, while in 1911 the total gas sold for industrial heating purposes in Birmingham amounted to only 389,511,000 c.ft., representing 5·06 p.ct. of the total gas sold, for the year ended March 31, 1926, the total amount of gas sold for industrial heating purposes was no less than 2,643,998,600 c.ft., or 19·74 p.ct. of the total gas sold for all purposes—this representing an increase of over 650 p.ct. for the period stated. It is, I think, fully appreciated that the development of this industrial load has been largely due to the action of the Birmingham Gas Committee in establishing a special section to deal with the application of gas to industry. The special section referred to was established in 1911; and since that date it has been engaged in the development of the use of gas for the multifarious industries of this city.

I should like here to refer to an installation of melting furnaces operating on town gas which was erected at the works of the Birmingham Aluminium Castings (1903) Company, Ltd., when this firm occupied premises in Cambridge Street, Birmingham. This battery of furnaces was one of the first large installations which this particular section of the Birmingham Gas Department had to deal with; and very shortly after conducting experiments on the use of gas for aluminium melting in collaboration with the engineers of this Company, a consumption amounting to no less than 30,000 c.ft. per hour was obtained.

This is of particular interest, as this Company have now removed their works into the Smethwick district, and are now taking their supplies of gas from the Smethwick gas undertaking (for the melting of aluminium and other purposes) which I understand amount to some 160 million c.ft. per annum. It is also interesting to record that the Company have continued to use gas as an industrial fuel from the time of the installation referred to at their works in Birmingham up to the present.

General Observations with Regard to the Design of Industrial Heating Plant.

With reference to the developments which have taken place in recent years in the design of industrial heating furnaces and apparatus generally, these have been largely as a result of the collaboration between the user of the apparatus, the undertaking supplying the gas, and the manufacturer of the heating apparatus. This, I think, is a very healthy sign, as only by such collaboration is it possible to satisfy the requirements of the user, and at the same time provide apparatus to function with the greatest possible economy for the particular operation. In practically every trade, the requirements of the manufacturer vary slightly; and it is the duty of those responsible for the supplying of the apparatus to see that the furnace plant installed has been designed to meet fully the requirements of the user.

While in many instances furnaces of standard design can be employed for a large number of heating operations, it is nevertheless very often found to be advisable to effect modifications—such as slight alteration to dimensions, method of guard tiling, fitting specially-designed doors, and similar minor changes—which make all the difference between the furnace meeting with complete success or failure in the operation for which it is required. I cannot too strongly emphasize the importance of those responsible for the supplying and installation of furnace plant paying every attention to such details. Usually, such modifications as suggested here can be carried out at a reasonable cost; and the consumer is all the more satisfied in that he has been specially catered for.

With regard to improvements in design, there is no doubt whatever that the main direction in which improvements have taken place is in the recovery of waste heat by means of recuperation or regeneration; and where the heating operation is of a more or less continuous nature, the modern type of recuperator or regenerator will undoubtedly prove far superior to the direct-fired type of furnace. It must not be forgotten, however, that the direct-fired low thermal capacity furnace will always have a place where the heating operation is not continuous, and where the process of heating-up from cold must be carried out as quickly as possible. For this type of furnace, the employment of refractories having high thermal conductivity has led to considerable improvement, more particularly where a furnace has to be designed in such a manner that a high working temperature can be obtained in the least possible time. It will be understood that for intermittent working, where perhaps a direct-fired furnace will have to be used, or where at the most a limited amount of recuperation is possible, the efficiency will fall short of that obtainable in the case of the larger recuperator or regenerator type of furnace, which is more suitable for long-period working owing to increased thermal capacity.

We have had, during recent years, some excellent examples of both types of plant; and I should like here to refer to the "Revergen" furnace, manufactured by the Davis Furnace Company, of Luton, a regenerator type capable of working at a very high efficiency; and also to a recuperator furnace of Messrs. Gibbons Bros., Ltd., of Dudley, as well as to recuperator furnaces manufactured by the Incandescent Heat Company in this district, and many other excellent types. The Lucas series is also an example of modern high-efficiency furnaces, suitable for the many heat-treatment operations which have to be catered for.

Another important question which has received every consideration during recent years is that of lagging; and I think most of our furnace makers are to be congratulated on the attention they have given to this most important question. In some instances, by careful selection of lagging material, economies amounting to no less than 10 p.ct. have been obtained, by the reduction of the radiation losses from the outside surfaces; and this, taken in conjunction with the extra economies due to the perfecting of recuperators and regenerators, and also particularly in regard to the mixing of air and gas in correct proportions prior to combustion, has made the modern gas-heated furnace a scientifically-designed piece of apparatus, capable of carrying out its functions almost in the same way as a machine tool.

Indirect Advantages to be Obtained by the use of Gas Furnaces.

I mentioned above that I should refer particularly to some of the indirect advantages to be obtained by the use of gas-heated furnaces; and as a typical example of the considerable economies which can be effected, I would like now to take the application of carburizing and re-heating of steel components, which operations may be accepted as typical of many similar heat-treatment operations at present called for by the cycle, motor, tool, and electrical trades.

In practically every modern hardening shop, one finds that the gas furnace is to-day being used for such work. It has completely replaced the older type of solid fuel furnace; and despite the fact that one might still argue that several well-designed types of solid fuel furnaces might be capable of carrying out the operation at a lower fuel cost, it must be remembered that in this application the fuel cost is not a prime cost, and it is in view of the indirect advantages to be obtained by the use of gas furnaces that this form of fuel has so firmly established itself for operations of this kind. With a well-designed gas-heated furnace operating continuously throughout a period of ten hours per day, it would be found that small mild-steel components—such as gears, ball races, and cycle spindles—could be carburized with a gas consumption of about 25,000 c.ft. of 500 B.Th.U. gas per ton.

Now, where this operation is carried out in a well-designed solid fuel fired furnace, a good average figure for coal consumption might be taken as one ton per ton of components carburized and heat treated. It can be shown, however, that, while the fuel cost alone may be lower in the case of the solid fuel fired furnace, the advantages to be obtained and the economies to be effected by the employment of gas furnaces for this class of work are so great as far to outweigh this slight difference in fuel cost. With the gas-heated furnace, one will invariably find that the work comes out with absolute uniformity, and the risk of scrapping work is reduced to a minimum. Further, for a given floor space, the throughput of work will in some cases double, and the labour involved in carrying out the heating operation be halved. I think it will be agreed that, apart from the economies effected under these various headings, the improved quality of product in itself will be easily sufficient to justify any reasonable increase in fuel cost, as a little calculation will show that in such an operation the total cost of fuel involved rarely exceeds 2 p.ct. of the value of the articles being treated.

In such operations as these there are many other advantages which are peculiar to gas furnaces; and, in this connection, may I refer to one in particular which is now beginning to be realized among many manufacturers engaged in the automobile industry? I am referring to the use of alloy pots for carburizing, close annealing, and similar work. We have recently seen very great developments in the use of nickel chrome alloys and stainless steels in their application to containers for carburizing and annealing operations; and a series of experiments extending over some years in our own testing shops has proved that, where gas furnaces are employed, very considerable reductions in pot costs for such operations as carburizing and annealing can be obtained by the employment of these special alloys, as compared with the employment of steel pots. It has also been shown that these advantages do not obtain in the case of the ordinary types of solid fuel fired furnaces; and, further, that the economies referred to can only be realized with solid fuel if muffle type furnaces are employed—this, of course, leading to considerable increase in fuel costs. I mention this merely as an example of one of the many indirect economies to be obtained by the use of gas for general heat-treatment purposes; and one could quote many more similar examples applying to different operations in other trades.

As a second example of economies which can be effected, I should like to refer to the use of town gas for the annealing of glassware. It may not be generally known that town gas has been used with every satisfaction for the heating of lehrs for the process of annealing heavy cut glassware; and the results of a large number of experiments carried out on furnace plant of this kind showed that, in every instance, the reduction in breakage was indeed considerable. In one particular case which came to my notice, where the glassware handled was of substantial value, a reduction of 40 p.ct. in the breakage was realized; this being more than sufficient to pay the whole of the fuel charges for the operation.

While time will permit me to deal with only a few of the more important applications of gas to industry in detail, I would refer those who wish for a more comprehensive treatise on this subject to the excellent paper on "The Use of Town Gas in Industry," presented by Sir Arthur Duckham, K.C.B., to the First World Power Conference, in 1924; but I now propose to refer to some applications more in detail, giving, where possible, figures of efficiency which have been obtained with various types of town gas-heated apparatus.

It has been estimated that town gas is now being employed as a fuel in no less than 3000 distinct industries in this country; and in Birmingham alone upwards of 1000 industries are dependent on the gas supply of the city for carrying out the multifarious heating operations in its factories and workshops. The advantages of a supply of fuel by pipe to manufacturing premises, where floor space is limited, cannot be over-estimated; and it is gratifying to be able to mention that, during the recent coal stoppage, Birmingham manufacturers and other consumers were able to enjoy a full supply of gas for the entire period, and were thus enabled to continue their manufacturing operations so long as supplies of raw material were

available. I am also glad to say that this latter remark applies generally to the majority of gas undertakings in this country.

SPECIAL APPLICATIONS.

I have set out below a few special applications which are of particular interest, and which will generally be found to exist in any industrial centre.

Water and Solution Heating.—Town gas has been adopted very widely for the heating of water and solutions in open tanks, owing to the simplicity of the process and the efficient lagging which can be used, as against the inefficient method of heating by solid fuel. Tanks of this kind can be brought to any desired temperature very rapidly, and easily maintained on a low gas consumption. Water heating to boiling-point, in an efficiently lagged tank with well-designed gas-burners, can be carried out with an efficiency of over 70 p.ct.

Steam Raising.—The application of town gas to this solid fuel stronghold has made rapid strides of recent years, owing to the introduction of gas-heated boilers capable of raising steam on a high thermal efficiency basis—such as the Spencer-Bonecourt boiler, in which a thermal efficiency approximating to 85 p.ct. can be obtained. In cases where relatively small quantities of steam have to be generated in a limited space, the arguments of cleanliness, ash reduction, &c., usually applied to gas heating, are incontrovertible in this application; and the adaptability of the gas-heated boiler in comparison with the solid fuel boiler cannot be disputed. One familiar instance brought to my mind is of a boiler feeding large presses, which is placed in a small cellar under the shop floor, and which shows a very big saving in total costs over a solid fuel boiler doing exactly similar work at another depôt of the same company.

Varnish Manufacture.—A large number of works, both in London and in the Provinces, have "all-gas" plants in operation for the boiling of gums and oil for the production of varnishes, enamels, &c. The absolute controllability and reduction of fire risks have had a great bearing on the change-over from solid fuel; and there is no doubt that the thermal efficiency of the operation has been very considerably increased. With solid fuel a large fuel bed was required for both gum and oil boiling, and a heavy pull on the stack to enable the necessary temperatures to be reached—this undoubtedly leading to a very high flue temperature and small heat value being obtained from the fuel used. By the use of town gas, combustion spaces have been reduced to a minimum, and direct contact with the heat source has been obtained. The general opinion of varnish makers who have adopted gas for heating their varnish kettles and oil boilers is that a return to the use of solid fuel cannot for one moment be contemplated.

Melting of Metals.—Town gas has been widely used for the melting of all metals and alloys, from the low melting-point white metals—such as tin, solder, and bearing metals—to the higher melting-point metals—such as aluminium, brass, copper, gunmetal, gold, silver, &c.—and owing to the ease with which exceptionally high temperatures can be obtained, gas is adopted in many instances for the melting of nickel and nickel alloys requiring temperatures in some instances as high as 1650° C. Taking aluminium as an example of the application of gas to the melting field, this metal or its alloys are extensively used in the manufacture of both domestic and industrial articles; and in almost every case where a supply is available, gas is used as a fuel for melting, and can easily compete with other forms of fuel, owing to the highly efficient manner in which it can be applied. Where this metal is melted in open-type furnaces, as distinct from furnaces requiring iron pots or plumbago crucibles, a figure as low as 3 c.ft. of 500 B.Th.U. gas per pound of metal melted can be obtained, representing an efficiency of approximately 35 p.ct.

Drying Operations.—Under this heading I am including furnaces or stoves used for the drying of cores for foundry work, the japan and lacquer drying operations to be met with in the cycle, motor, and cabinet brassfoundry trades, and the stoves used for metal colouring. It would be very difficult indeed to arrive at anything like an accurate estimate of the total gas consumption all over the country in stoves carrying out the operations mentioned above; the ease with which all ranges of temperature are obtained and maintained with a minimum amount of human control making town gas practically the only form of fuel possible when work of this kind is under consideration. Recently the improved conveyor type of drying stove has been widely adopted in many industries for core drying, japanning, lacquering, and similar operations; and town gas is almost invariably employed in such apparatus.

GENERAL HEAT-TREATING OPERATIONS.

Annealing.—The gas furnace, either of the direct fired or partly recuperative type, has practically made the solid fuel furnace non-existent for the annealing of stampings, pressings, and spinnings, in either brass or steel, where short-period or intermittent working is required. The low cost of initial installation, cleanliness, ease and accuracy of temperature control, saving in space, and improved quality of work, have led to the use of the gas furnace in our manufacturing concerns to an extent which is rarely realized; and tests have shown, using even a direct-fired furnace without any form of recuperation, a figure as low as 1·8 c.ft. of 500 B.Th.U. gas per pound of metal heated to a temperature of 650° C. in the case of brass pressing—representing an efficiency of 12½ p.ct. When large quantities of metal have to be dealt with, furnaces of the recuperative type are used. During a recent test on brass strip annealing in a furnace of an improved recuperator type, in which 3¼ tons of metal were heated, an efficiency of 24 p.ct. was realized.

Carburizing and Re-heating.—The bulk of the carburizing and re-heating operations carried out in the motor and allied engineering trades are performed in gas-heated furnaces. The modern demand for a highly scientific product has forced the use of solid fuel, with its uncertainty, uncleanliness, and lack of control, into obscurity.

Fig. 1 represents a battery of two Incandescent Heat Company's natural draught furnaces installed in the demonstration shops of the Birmingham Gas Department. Large batteries of furnaces heated by gas are to be found in all large and small works, manufacturing motor gear parts, and engineering

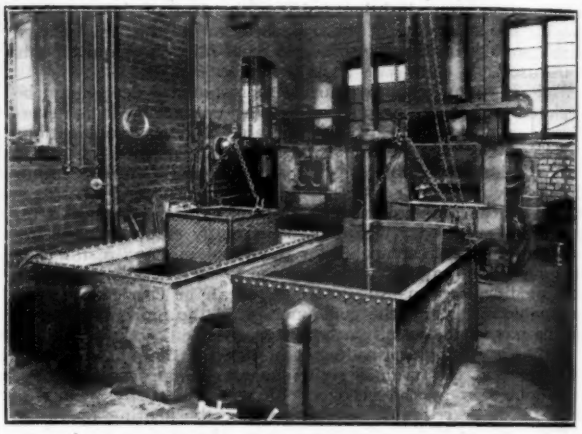


Fig. 1.—Natura Draught Gas Furnaces in the Birmingham Demonstration Shops.

machinery, for the carrying out of carburizing and re-heating, and tool-hardening operations called for in the modern hardening shop. The gas furnace in this instance lends itself wonderfully to the high degree of accurate temperature control now demanded in any modern engineering works.

Fig. 2 is a photograph of one of the heat-treatment shops of Messrs. Joseph Lucas, Ltd., of Birmingham, and is typical of a modern hardening shop, equipped with gas-heated furnaces

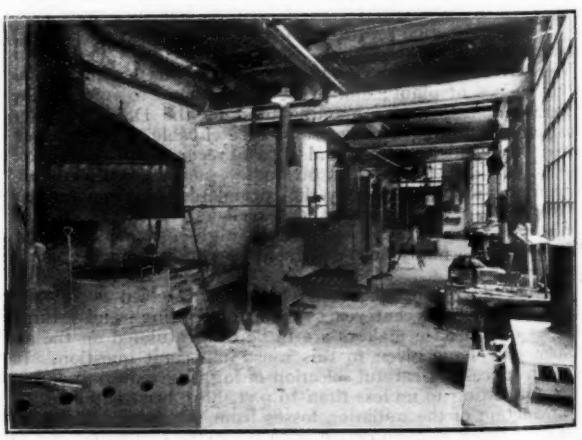


Fig. 2.—A Heat Treatment Shop at Messrs. Joseph Lucas' Works.

and apparatus. Very considerable numbers of recuperator type furnaces are used in Birmingham in connection with the production of motor components. In one works in the Midlands, over 1000 tons of motor gear parts per annum are heat-treated in gas-heated furnaces. The yearly consumption of this firm amounts to over 33,000,000 c.ft.

Fig. 3 is a photograph of a battery of two large gas-heated high-temperature furnaces constructed with recuperators by Messrs. Gibbons Bros., Ltd., at the works of Messrs. Henry Wiggin & Co., Ltd., for raising nickel alloy billets to a forging temperature of 1150° to 1250° C. Low-pressure gas is em-

Fig. 3.—A Battery of Gibbons High-Temperature Recuperator Furnaces.

ployed for this purpose, and the furnaces are fitted with carborundum muffles.

Fig. 4 is a similar, but larger, furnace installed at the same works for the re-heating of nickel alloy bars for the purpose of rolling.

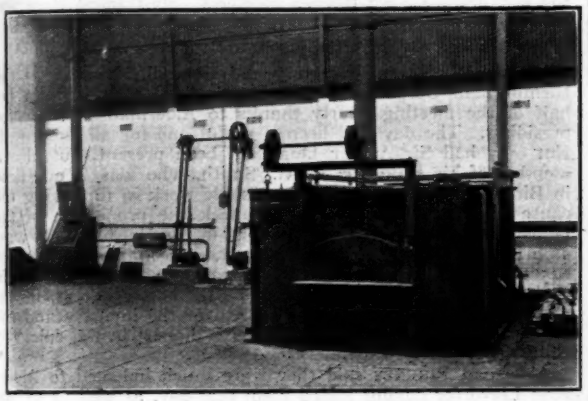


Fig. 4.—A Gibbons Natural Draught Muffle.

High Speed Steel Hardening.—This process requires a very high temperature, usually in a small space; and gas is almost universally used for this particular operation.

Forging.—A considerable quantity of gas is sold for the production of forgings, such as the common nut and bolt. The operation is performed by gas, in a very efficient manner, owing to the high production which is obtained. During a special forging test conducted on a practical scale, an efficiency of 32 p.ct. was obtained for this operation, with a gas and air furnace of the direct-fired type. The gas furnace can be designed to keep pace with almost any reasonable rate of heating demanded by this operation.

Rivet and Plate Heating.—Gas is now being used largely in shipyards and constructional steel works for the heating of rivets and plates, and has proved highly satisfactory for this purpose. Practical tests carried over a long period have shown that the small continuous rivet heating furnace, fired by town gas, is capable of producing larger quantities of heated rivets in a given floor space, and also at a lower cost, than with solid fuel or oil. For the heating of large plates, gas has again been used to some considerable extent; and in this operation the cleanliness of town gas as a heating agent results in plates being heated more uniformly and with a minimum amount of scale, while the contaminating influences of a sulphur-laden atmosphere are entirely dispensed with. Some very large furnaces have been installed in different parts of the country in this connection.

Enamelling.—The new designs of recuperative types of gas-fired furnaces of the muffle type have been quickly adopted by the enamelling trade, replacing in every instance furnaces using solid fuel; and there is no doubt that this trade will use gas much more extensively in the future.

Porcelain Firing and Firing of Ceramic Ware.—In a number of instances recently, gas furnaces have been installed for the firing of porcelain and ceramic ware. For example, electrical insulators demand a temperature of 1450° C. for firing and glazing; and this temperature over a large area is easily obtained with gas as a fuel. For this work, the regenerator type furnace has been successfully employed; and several "Revergen" furnaces manufactured by the Davis Furnace Company have been installed in Birmingham for dealing with work of this nature.

Food Production.—Apart from the high thermal efficiency obtained by the use of gas as a fuel in any works producing articles of an edible nature, the questions of absence of smoke and dust, general cleanliness of plant and surroundings, and temperature control, must be given special consideration in the choice of a fuel for heat operations for the production of bread and confectionery, sweets and chocolates, frying of potatoes in large quantities, cooking of fish and chips, &c. Producers of these classes of goods are fully alive to the advantages which gas offers as a fuel for these operations.

The Use of Town Gas in its Relation to the Conservation of Coal.

When considering the application of fuel in its relation to the conservation of coal, the question of over-all efficiency of application is naturally one which must receive the most careful attention. In any operation requiring the expenditure of heat energy, the efficiency of utilization of the heat energy as referred to coal must be the ratio of the sensible heat utilized in heating-up the load to the total heat content of the coal itself. Here it is interesting to note that, during the last few years, the efficiency of the process of carbonization of coal in gas-works has gradually increased, owing to changes which have taken place in methods of carbonization, and also to the more complete recovery of the waste heat incidental to this process. It is gratifying to find that to-day carbonization of coal in continuous vertical retorts equipped with waste-heat recovery can be carried out in a gas-works with a thermal efficiency of over 85 p.ct.

While it cannot be disputed that the valuable deposits of coal with which this country is so well blessed have constituted the foundation upon which the wealth of the nation has been built, it is nevertheless astonishing to find that such huge quantities of this fuel have in the past been so uneconomically employed, both industrially and domestically; and it seems only of recent years that the scientific utilization of this great source of heat, light, and power has received the attention it deserves. From the report of the Royal Commission on the Coal Industry (1925), it would appear that in 1924 no less than 33·75 million tons of coal were used for domestic purposes, and 70·23 million tons for general manufacturing. The application of town gas for domestic heating will undoubtedly lead to an enormous reduction in the amount of raw coal at present used for this purpose; and at the same time the industrial application of town gas will, in the same way, reduce the wasteful utilization of raw coal for manufacturing. In our secondary industries, the opportunities of employing town gas with advantage are enormous; and even in some of our primary industries, this fuel is being used in place of solid fuel, owing to its higher efficiency of application.

In conclusion, it behoves all of us as citizens, and some of us as masters of industry, to see that fuel is utilized economically in order to conserve as far as possible the dwindling coal supplies of the country, and hygienically in order to prevent pollution of the atmosphere in which we live. The applications of town gas, both domestically and industrially, have contributed largely, and I think are destined in the future to contribute to a very much greater extent, towards the realization of these great ideals.

Discussion.

Alderman PINKNEY said they were greatly indebted to Dr. Walter for the amount of thought and hard work he had put into the paper. It appeared that the laboratories at Birmingham must be a veritable hive of industry.

Sir ARTHUR DUCKHAM, proposing a hearty vote of thanks to Dr. Walter, said he had given them a very complete and conclusive paper. They must all realize the great debt of gratitude they owed to Dr. Walter for the services he had rendered to the gas industry and to industrialists generally. ["Hear, hear."]

A Wonderful Field for Gas.

With regard to the use of town gas for industrial purposes, one could not fail to see—particularly after going round such a works as they had seen that morning—what a wonderful field there was here for gas. All industrial heating practically came down to constant temperature working. Imagine solid fuel applied to industrial purposes. There was the storage of coal, transport, constant attention required, effect of the clinker on the furnace, removal of ashes, &c. Then there was the amount of wastage that occurred with solid fuel furnaces simply because one could not maintain an absolutely constant temperature. Now to a man running a works, and looking at a situation like this, the price of fuel was not a very important factor. It must be recognized—and, as a matter of fact, it was being recognized—that, even at many times the cost of solid fuel, gas paid handsomely under certain conditions. Apart from direct financial considerations, anyone going through the industrial areas of the country and taking note of the state of the atmosphere, must feel that a person who allowed volumes of contaminating smoke to pass from his chimneys was really a criminal. He was committing a crime against his fellow citizens. They could not speak too forcibly in bringing this matter to the attention of the public. It was to gas furnaces and to the work of the gas industry that people must look to help them to the solution of this great problem. With regard to heating furnaces, two things struck him as requiring special attention. The first of these was that as far as possible they should prevent loss of heat. Considerable study—but not yet enough—was being given to the subject of insulation. The second was that the

products of combustion, after they had done their heating, should pass away as cool as possible. In other words, there should be employed some form of regeneration or recuperation. They had a real thing to fight for, in advancing the use of gas for industrial purposes.

A Very Convincing Case.

Mr. A. Lindsay Forster (Glasgow), seconding the vote, said he had been so long in the district that he almost felt himself to be a Midlander. Dr. Walter had presented them with such a wide field of thought that it was rather difficult to know at which angle to take it. He wished to support the view that gas was of extreme value; and, indeed, the paper showed this. Gas furnace design was, he thought, admittedly in a relatively early stage. A great deal had been done; but they could see, reading between the lines of the paper, that the author considered much more remained to be done. How much this was to be a matter of detail, and how much a matter of principle, it was not necessary now to decide; but one of the great difficulties which they had in adapting gas to the heating problems of industry was to get really close to the theoretical basis in the design of their heating apparatus. There was extremely little on which to go. One difficulty was to know exactly how one could express efficiency in order to make a comparison. The author had quoted many instances of the use of gas in industry; and this emphasized the facility with which this fuel could be applied to problems of heating of a varied nature. He himself had had experience of small units in the glass industry. Many difficulties were met with there, including that of sulphur. Would Dr. Walter tell them whether they had quite got rid of sulphur in the gas industry? One of the things which had been of great assistance in the application of gas in industry was the fact that there was a substantial pressure of distribution in the mains. This had a great deal to do with the facility with which gas could be utilized. The regulation of pressure was one of the things with which the gas industry had been remarkably successful; but there were times when drops in pressure occurred, and this, no doubt, they were arranging to overcome. On the subject of general efficiency the gas industry was able to put forward a very convincing case, not only from the point of view of convenience to the manufacturer, but on the score of the economic argument that it was a fundamentally sound proposition in that it saved fuel. Gas was in a very strong position there. Indeed, there was no other source of heat available to-day which could put forward so strong a case. He believed the gas industry was the greatest asset the country had in the conservation of its fuel resources. They were much indebted to the author for having put so many interesting facts before them, and for the great trouble he must have taken in the preparation of his paper.

Value of Industrial Consumption.

Mr. F. C. Briggs (Dudley) remarked that, on behalf of the Midland Association of Gas Engineers and Managers, of which he was President, he desired to support the vote of thanks. The paper must make a strong appeal to gas salesmen. It pointed out to them lines on which gas could be developed to the utmost. Electricity hardly had a footing here. He had noticed, as a matter of fact, that the electrical industry was producing a steam boiler; but it was not for him to speak as to its thermal efficiency or economy. Industrial business was sometimes difficult to get, because they must prove their facts conclusively. This could, of course, be done; but they must go "all out," and be careful to neglect no opportunity. For having placed so much valuable information at their disposal, they were all greatly indebted to the Birmingham Corporation Gas Department. Industrial consumption of the kind referred to by Dr. Walter was particularly useful to obtain from every point of view. It furnished a load during the day which came on and went off at the right time. When gas was not being consumed for cooking, it was being used in industry; and this tended to decrease the price to the domestic consumer. The more gas they sold for industrial processes, the lower would be the charge for domestic purposes. So far as his own experience went, all the sulphur that mattered had been eliminated from gas as distributed. In the case of his own town, this had been proved.

Gas and Social Legislation.

It would be useless to appeal to the manufacturer to use gas instead of coal because it would give "clean air," if at the same time it could not be shown that it was a paying proposition. People were in business, and had to make money; but if they did not have the smoky conditions from which workers suffered so much, and the necessity for a great deal of the social legislation were done away with, manufacturers would be helped considerably. Would it not in the long run pay them, even though the cost might be a little higher, to use gas instead of coal, if it led to more contented and more healthy labour, which would give a better return?

No Trouble from Sulphur.

Dr. Walter, replying to the point that had been raised about sulphur, said that any sulphur that might be present in gas was only in very minute traces, and then not as H_2S. Any trouble that might be experienced in the glass industry was not due to sulphur at all. In the industries in Birmingham there were operations that were so delicate that if there were any sulphur present, it would be discovered immediately. Some of the manufacturers really furnished more sensitive tests than the Gas Department could carry out themselves with lead acetate. Before five minutes had elapsed they would hear of it if there was any sulphur existing as free sulphur in the gas. There were many cases in which a low-pressure gas supply could, with great advantage to the consumer, be boosted up, and then dropped down through governors. He thanked those present for the manner in which they had received his paper.

Acknowledgments.

Mr, A. W. Smith (Secretary and General Manager of the Birmingham Corporation Gas Department) expressed on behalf of the meeting hearty thanks to Alderman Pinkney for presiding. The day had been a useful one for all concerned. Not only had Sir Arthur Duckham been present, but also a member of his staff, Dr. E. W. Smith, who was at one time in Birmingham, where he did valuable work in furthering the cause of gaseous fuel. In Smethwick the proportion of the industrial load was even greater than in Birmingham. It was, as a matter of fact, well over 42 p.ct.—358 million c.ft. out of 845 millions. This showed the importance of the subject in such an area. If they were to make the best progress, it was absolutely essential that the salesman of the industry and the makers of furnaces should be perfectly honest in the efficiency claims they put forward.

Alderman Pinkney said they were much indebted to Alderman Lloyd for having joined them that day, as well as to Mr. A. W. Smith, who always rendered any assistance he could to his neighbours. Both Mr. Mason and Mr. Hardiker, together with their staffs, had worked hard to make the conference a success; and he thought they had succeeded. ["Hear, hear."]

Clean Air Campaign.

Smethwick's "Clean Air Campaign" received valuable assistance in the evening from Dr. C. W. Saleeby, F.R.S. (Edin.), who lectured in Prince's Hall, Smethwick, on the importance of a pure atmosphere.

DRY CLEANING OF COAL.

[Extract from a Paper by R. Bulmer, of Consett, at a Meeting of the Coke Oven Managers' Association (Northern Section) at Armstrong College, Newcastle, on March 5.]

The impurities associated with raw coal, and which collectively constitute what has hitherto been referred to as the "free ash," embrace a variety of inorganic substances, the physical properties of which cover a wide range. A general examination of the foreign matter present in uncleaned coking smalls will reveal this clearly. Probably the most important point, however, is the fact that often the "free ash" possesses a higher specific gravity than the purer coal. Cases are not infrequently met in which the specific gravity of the foreign matter is twice that of the coal substance. On the other hand, sometimes little difference exists in this direction, and often the coal contains little "free ash" which is appreciably denser than the coal itself. It is hardly necessary to state that the now well-established, older methods of purification depend for their efficiency largely, and in some cases altogether, upon difference in specific gravity between the coal and its associated foreign matter.

In view of the foregoing, it is not surprising that a considerable amount of thought and money has been bestowed upon dry cleaning propositions within recent years. It would, therefore, appear opportune to consider a few of the more important developments in dry cleaning.

The Spiral Separator.

This means of purification consists essentially in causing the raw coal to travel down a spiral chute which is inclined towards the centre. During its descent the mixture is separated by reason of the differences in coefficients of friction, relative shapes, and specific gravities of the particles of coal on the one hand, and the associated free ash on the other. The actual result of operation of these differences is to cause the coal to travel along the outer edge of the spiral, while the shaley impurities tend to remain on the inner side. The spiral itself is flanged in such a way as to prevent the shale and coal mixing again, and they are thus ultimately delivered by separate spouts into appropriate receivers.

The process requires, however, that each type of coal must be treated by a specially designed spiral, if perfect separation is sought; and, generally speaking, the best results are obtained when the coal and shale particles differ in shape—as, for instance, cubical coal particles contrasted with lenticular shale. Certain limiting sizes of the particles of coal to be treated must be observed, and for this reason preliminary screening of the coal is an essential.

The spiral separator probably represents one of the cheapest methods of dry cleaning hitherto suggested, and is, in fact, becoming very popular among British collieries.

Pneumatic Separation of Coal

Attention is at present being paid in certain quarters to processes for the dry purification of coal which depend upon the principle of flotation of the coal in air. There are several modifications of the process; and among these will be found the most successful commercial plants existing at the present time.

In general terms, the pneumatic process may be described as follows. The separator itself consists of an inclined "deck" or table which is perforated, and through which a current of air is blown in an upward direction. The table is also caused to jig by means of a suitable mechanical arrangement which is so designed, in some cases, as to give a slightly upward cast. The coal to be treated must be carefully sized, and in this condition is fed regularly on to one of the upper corners of the table. The combined action of the table motion and the upward current of air tends to stratify the coal and its free impurities much in the same way as when the coal is shaken up with an aqueous solution; the free ash forming the lower strata while the purest coal is found to be uppermost. The table is also fitted with fixed tapered riffles which are arranged in the direction of the jigging motion and are spaced across the table parallel to one another. The lower strata are thus held between the riffles and travel along the table by reason of the head motion imparted, and they are released gradually owing to the riffles' taper, roughly in order of ascending specific gravity. Meantime the purer coal particles escape the riffles and are delivered from the side of the table owing to the slope or tilt mentioned above. Adjustable cut bars are fitted to the delivery side of the table in order that the products may from time to time be modified in composition as that of the raw coal varies.

It is possible by means of this arrangement to divide the coal into (*a*) clean coal, (*b*) middlings (which would include portions of the coal containing a high natural or inherent ash—*e.g.*, bone coal), and (*c*) refuse.

The essential conditions for successful operation of such a plant would appear to be:

(1) Careful grading of the coal on suitable screens before treatment.

(2) The coal must not be unduly wet.

(3) The operation of the table must be appropriately adjusted to the particular size and nature of the coal.

For the purpose of dry cleaning operations such as that described above, screens of very high efficiency are necessary; and within recent years high-speed vibrating screens have become of general use. The principle of vibration in a vertical direction at high frequency and low amplitude has been highly developed; the means to this end being electrical and mechanical in some cases, while in others the motion is obtained by mechanical means only. The advantage of such screens is mainly to be found in their concentrated action, for in some cases the screens are capable of dealing with as much as 2½ tons of coal per sq. ft. of screen area per hour.

Coal Cleaning without Preliminary Sizing.

Several attempts have been, and are now being, made to perfect dry coal cleaning processes which do not require the coal to be prepared beforehand by screening. The sizing of coal by this means is undoubtedly the more troublesome part of the processes now successfully operating and generally described above. It would, therefore, appear that encouragement should be given to those processes being developed in the direction of dry cleaning without sizing.

Such methods tend to employ various principles not included in those already referred to above. They may be roughly divided as follows:

(1) Flotation of the coal in a dry medium.

(2) Stratification of non-uniform particles by means of air.

(3) The use of such properties as differential resilience of unequal particles.

Flotation in Dry Medium.

One of the most fertile suggestions which has come into prominence recently is that made in a paper before the American Institute of Mining and Metallurgical Engineers (Trans. Amer. I.M.M.E., February, 1926), by Frazer and Yancey, who gave an account of an "air sand" process for separating coal and its impurities. They pointed out that by blowing air through a bed of dry sand at a suitable rate the resulting fluid may be maintained at such a density that the coal will float at or near its surface, while the heavier impurities will sink to the bottom of the vessel in which the operation is performed. This separation will take place though the raw coal treated may be composed of various sized particles. A patented process is in course of development on these lines, and the results will be awaited with considerable interest. It is an essential of the process, however, that the coal must have its smallest constituents separated from it before treatment on the sand bath, for the reason that subsequent to flotation it is necessary to screen the coal and sand, so that the two may be separated.

Stratification of Non-Uniform Particles.

Attention has also been called to a pneumatic process which is being developed and for which it is claimed that treatment of unscreened coal can be successfully prosecuted on a large scale. The process may be briefly described as follows: Run-of-mine coal received from pithead is passed over a 3-in. screen, and the oversize is passed on to a 3-in. breaker, which is used to break the lumps of coal and so set free the adherent shale. The broken lumps are then passed back to the main bulk of run-of-mine coal, which is conveyed to a large storage bunker. The coal from this bunker is suitably fed on to a pneumatic table in such a manner as to cause a thick layer of the raw coal to cover the whole width of the table. The top of the table being in the form of a pervious deck, allows of a blast of air being blown through it in a volume and intensity which causes the coal to float. At the same time the table is given a longitudinal reciprocating motion so that the coal is caused to travel towards the discharge end. The intensity of the air-blast action is carefully regulated in the different parts of the table, in order that more efficient stratification of the coal and shale takes place. The deck on which the coal is treated is fitted with riffles which are designed to retain the particles of impurity separated by the flotation. A single table is said to treat successfully about 200 tons of coal per hour.

Differential Resilience of Particles.

Under this head may be included a recent process which is difficult to describe, but which appears to promise successful application. In the operation of the process, the coal, which need not be accurately sized, is fed on to a specially constructed table, on which, by means of a jigging action, it is caused to strike against a series of small baffles or walls in such a way as to allow free operation of the relative coefficients of elasticity of the particles of coal and shale. A curious result is at first obtained, for the larger pieces of coal have a similar resilience to the smaller pieces of shale which they continue to contaminate, and in the same way the smaller pieces of coal remain mixed with the larger pieces of shale. The difference in size, however, is great enough to allow of fairly complete separation of the coal from the shale by subsequent screening. In order that separation can be fairly complete, the process of jigging on the table is repeated, usually by the provision of two or more tables in series. Although the process is still in babyhood, promising results have, so far, been obtained.

In the course of the discussion which followed the reading of the paper, Mr. C. P. Finn, of the Manvers Main Colliery, commenting on dry cleaning, stated that he had not been able to work a sound process for the fine coal. He could not say dry cleaning had been anything of a success. Mr. Holmes, of Birtley, held the opinion that coal should be carbonized wet. It would be more profitable to clean coal dry, and then moisten it, rather than clean it by washing, and then dry afterwards. Any process which eliminated slurry was worthy of serious attention.

Canadian Gas Association.—The Executive Committee have arranged to hold the twentieth annual convention of the Canadian Gas Association in Toronto on Thursday and Friday, June 16 and 17.

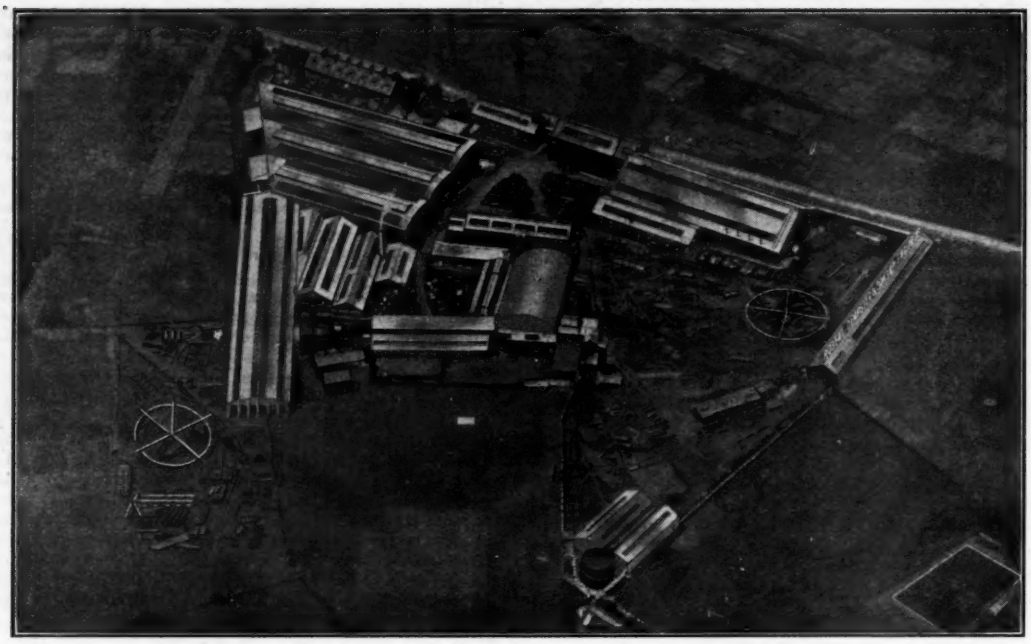
Wales and Monmouthshire District Institution.—We are informed by the Hon. Secretary (Mr. Octavius Thomas) that the next general meeting of the Wales and Monmouthshire District Institution of Gas Engineers will be held on Thursday, May 19, at Abergavenny.

Books Received.—Willing's "Press Guide," published by James Willing, Ltd., 30, King Street, Covent Garden, W.C.2; price 2s. 6d. "Gas Meters," by A. T. Gilbert; Second Edition, published by Crosby Lockwood & Son, price 7s. 6d. "Students' Catechism on Book-Keeping," by F. Davey; Third Edition, published by Butterworth & Co., price 5s. "Chemical Engineering and Chemical Catalogue," edited by Dr. D. M. Newitt; published by Leonard Hill, price 10s. 6d.

Cardiff Technical College.—Courses in fuel technology are to be inaugurated at the Cardiff Technical College. Principal Coles recently stated that, when the extensions to the College are completed, and a new plant is installed, it will be possible for the College to be of considerable assistance in the problem of the production, utilization, and marketing of coal. It is, he said, necessary to attack this problem in several ways: (*a*) The introduction of a course of training for those engaged in the whole question; a course of training for salesmen in the preparation of coal for the market, the analytical specifications of coal, and a knowledge of the combustible qualities of coal; research into problems of fuel production and utilization, both peculiar to the Cardiff area and in general; facilities for those experienced in the scientific side of the industry to pursue special courses in chemical engineering, with a view to widening their knowledge of the general developments of the industry, and to enable them to understand more generally the bye-products side.

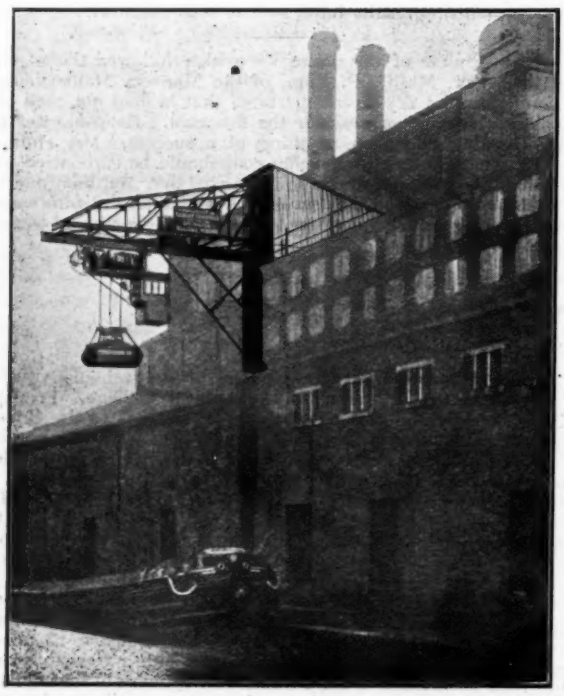
YORKSHIRE AND MANCHESTER JUNIORS AT ELLAND.

A Successful Joint Meeting.



BIRD'S-EYE VIEW OF THE ROSEMOUNT IRON WORKS.

The Annual Joint Meeting of the Yorkshire Junior Gas Association and the Manchester and District Junior Gas Association was held on Wednesday, March 15. Over 120 members of the two Associations accepted the invitation; and the main body met at Halifax, where they were received by representatives of the Elland-cum-Greetland Gas Company, and conveyed in motor coaches to Elland. Here they were welcomed by Mr. W. E. Dyson, J.P., Chairman of Directors, Mr. J. W. Fox, Vice-Chairman, Mr. G. Casson and Mr. J. Ainley, Directors, and Mr. J. Bridge, the Engineer and Manager. After partaking of light refreshments the visitors made a thorough tour of inspection of the works. The Engineer was freely complimented upon the excellent arrangements of the plant, its scrupulous cleanliness, and the goodwill which existed between him and the employees.



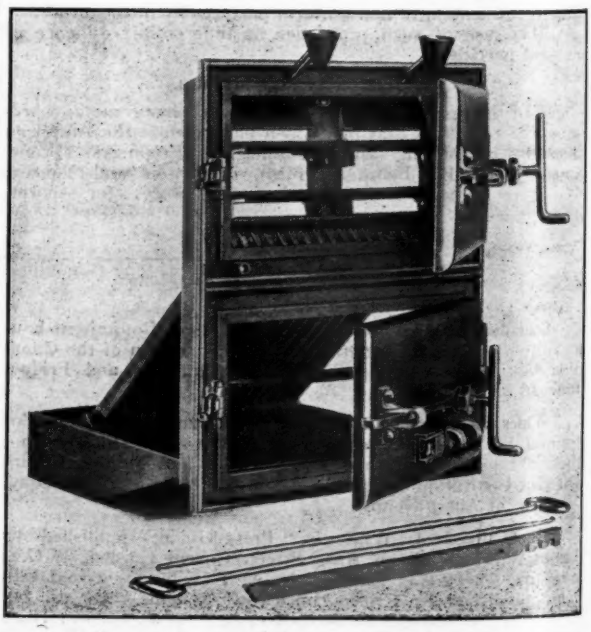
Coal-Handling Telpher and Jib over the Canal at the Elland Gas-Works.

THE ELLAND GAS-WORKS.

A full description of the Elland Gas-Works was given in the "JOURNAL" for June 4, 1924, when a visit by the Manchester District Institution was reported; but several interesting developments have taken place since then. For instance, the bucket elevator which was formerly used for unloading coal from the canal barges has been replaced by a Dempster telpher and grab capable of dealing with 20 tons per hour; the coal being afterwards conveyed to the stores by band conveyor, or to the vertical retort bunkers by gravity bucket conveyor. The next alterations and additions will be to the condensing plant.

CARBONIZING PLANT.

The older carbonizing plant and the two Tully plants have now been eliminated, and the gas is produced in the two half-million Dempster vertical units. These are twin benches, each complete with its own foul main, retort house governor, and blow-off valve, yet all interconnected at every level by platforms. Thus, while the advantages of staffing a large unit are retained to the full, the merit is secured of being able to let a



"Elland" Non-Clinkering Screen-Bar Grate (Dempster-Toogood Patent).

bench down completely cold for overhaul and repairs, whereby the comfort of men is increased and the strains on brickwork reduced.

The Dempster-Toogood system of vertical retorting is well-known, and was described by us in detail on the previous occasion [*loc. cit.*]; but we are now able to supplement that information with a photograph of the "Elland" non-clinkering screen-bar grate (Patent 1846/22).

In brief description, the grate is a steeply-inclined bar-screen which, owing to all the furnace linings being perpendicular, actually carries 100 p.ct. of the incandescent coke, so that each cob of coke as it descends must reach the screen, down which it creeps or gravitates. No less than 150 of these grates have been successfully installed in various gas-works.

Control and Distribution.

The works now have a well-equipped laboratory; and a Boys calorimeter is provided for the Gas Examiner. A continuous record of the quality of the gas made is obtained by a Simmance recorder, which is verified daily by a Junkers calorimeter; the latter being in continuous use for works tests. Coal tests and retort temperatures are taken each day along with the usual routine tests, and a complete gas analysis is made at least once each week.

The district of supply is characteristic of the West Riding of Yorkshire, and, being of a very scattered nature, does not lend itself to economical working. The area supplied is about 13 sq. miles; and the mileage of mains reaches no less a figure than 49. The consumption of gas per mile of main is low, but the consumption per consumer is satisfactory. Special attention is paid to district pressures; no less than four recorders being in daily use in various parts of the district.

A maintenance scheme has been in operation for the last three years. This is greatly appreciated by the consumers, and the output of gas consuming apparatus shows a steady increase.

Statistics of the Company for the year 1926 are as follows:

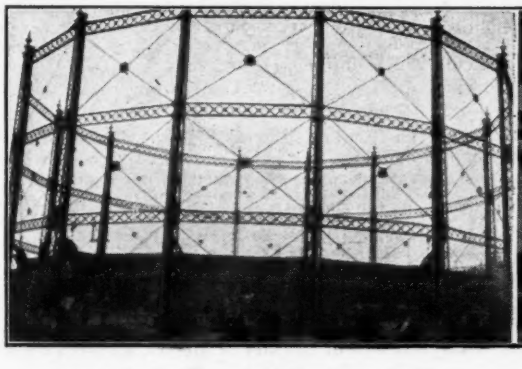
Gas sold, therms	717,522
Consumers	6,357
Ordinary meters	4,093
Prepayment meters	2,264
Cookers	2,497
Wash boilers	3,232
Gas fires	794
Gas engines	85

Re-Sheeting a Holder.

The old No. 1 holder (only one lift of its two was in use on the occasion of the last visit) has now been cut-out completely; and the storage consists of one holder of 128,000 c.ft. capacity, and one of 850,000 c.ft. The latter has four lifts; and some interesting repair work was necessary for it last May.

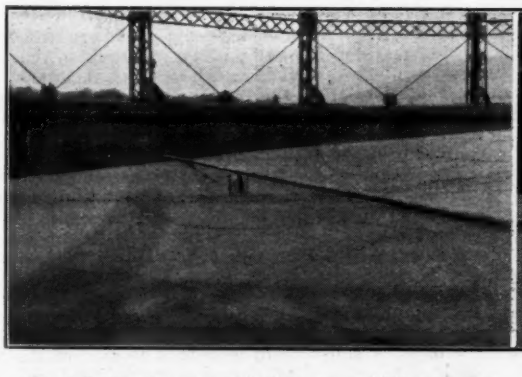
Four rings of steel sheets in the second lift, owing to deterioration, were replaced by Armco sheets; and new rivets were put into the inside channel guides, near the bottom of the third lift cup where previously there had been a leakage of water from the cup. On grounding the holder it was observed that the crown did not retain its correct form in between two of the bays. The holder was thoroughly ventilated by means of a Sirocco fan; and even then special precautions were taken in removing the first sheet of the crown over the affected portion. When this was removed, it was found that one of the principals of the stationary truss framing had broken away at a point where the cross struts were attached.

The four new rings of Armco sheeting could have been put in without emptying the water from the tank; but in view of the



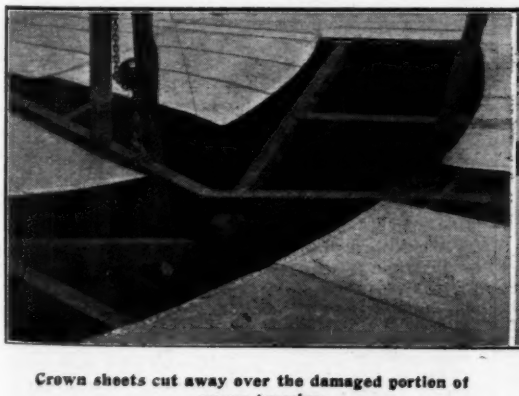
General view with second lift partially raised.

View showing fracture in main principal of crown trussing.

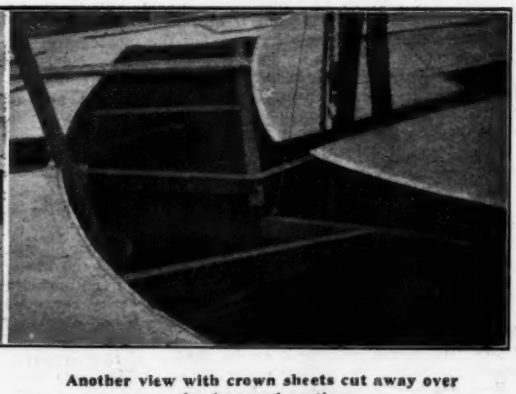


9-in. deflection in crown of holder. Second lift supported.

Another view, of the deflection in holder crown.



Crown sheets cut away over the damaged portion of crown trussing.



Another view with crown sheets cut away over the damaged portion.

trouble with the third lift cup and the unanticipated condition of a portion of the crown trussing, it was decided to empty the tank and make a full and complete examination. The local Council offered to loan the motor fire engine for pumping out the tank water at a charge of £4 per hour; but as this would have resulted in a charge of approximately £400 for emptying and refilling, a second-hand discarded fire engine was purchased for £20, and so satisfactorily did it work that one-and-a-half million gallons of water were pumped from the tank in 3 to 4 days.

Messrs. R. Dempster & Sons were the contractors for re-sheeting the four rings, and repairs to the cup and crown trussing were also executed by them; the whole of the work being carried out within the specified time of three weeks.

While the holder was out of action, the supply of gas—a daily output of 501,000 c.ft.—was fully maintained from the two small holders with a total capacity of 192,000 c.ft., of which only 64,000 c.ft. were at effective pressure. Those who have had experience with vertical retorts will realize what this meant on certain days with a consumption of 187,000 c.ft. in four hours.

Before undertaking the work, very careful calculations were made, and the flexibility of the vertical retorts was tested to the full, with the result that though the storage capacity was only equal to one hour's supply at normal effective pressure on certain days, for a period of four weeks the supply was fully maintained and consumers were not inconvenienced in the least degree. It is interesting to know that this work was carried out during the general strike and miners' dispute.

After the inspection the visitors proceeded by motor to the Elland Conservative Club, where lunch was served at the invitation of Messrs. Robert Dempster & Sons, Ltd., whose works were to be inspected during the afternoon. Mr. E. J. King, Joint Managing Director of Messrs. Dempster's, presided, and was supported by Mr. W. H. Handley, Joint Managing Director, and Mr. H. J. Toogood.

After the Loyal Toast,

Mr. W. H. Battersby (the President of the Manchester and District Association) proposed the toast of "The Elland-cum-Greetland Gas Company." He said that, from a gas-making point of view, the efficiency of the works was of the highest order. Mr. Bridge had been their Secretary, and had attained the highest honour they could offer—that of President—and he had spared no effort to put in successful hard work. The Board of Directors of the Elland Company were a progressive body. An instance of the business activity of the Company of which he had heard that day related to the time of the general strike. Repairs to the large gasholder had to be carried out. In view of the uncertainty in obtaining the necessary labour, it was questionable whether the repairs should be carried out. On due consideration, it was decided to proceed with the work; and as the water from the holder tank had to be pumped out, an estimate for this work was obtained from the local fire brigade. Their estimate was practically £400. Rather than accept this figure, the Company purchased for £20 an old fire engine, which did the work in four days. This proved that the Company were alive. He (Mr. Battersby) trusted that in the future they would continue to be as successful as they had been in the past.

Mr. W. E. Dyson, J.P., replying to the toast, remarked that the Dempster-Toogood vertical retorts were giving excellent results without being very costly in repairs. He complimented Mr. Bridge on the high efficiency of the works, which was due in large measure to Mr. Bridge's understanding of the men. Gas was first produced on the site in 1837. In 1861 the make was 7½ millions; and in 1926 160 millions were sold. It was not generally known that Mr. Robert Dempster first came to Elland as Engineer and Manager in 1855. That this gentleman foresaw great possibilities in the manufacture of gas-works apparatus was evidenced by the fact that he left the service of the Gas Company and founded the firm of his name which they would visit that afternoon.

Mr. S. T. S. Musgrove (President of the Yorkshire Association) proposed the toast of "Messrs. Robert Dempster & Sons, Ltd." He said that the Association had looked forward to this visit for a long time, for the works of Messrs. Dempster had a reputation for being efficient and up-to-date. He had been informed that since 1914 the capacity of the works had been practically doubled, which proved the great amount of confidence the firm had in their manufactures. The gas industry was progressing by leaps and bounds. When they found that firms like Messrs. Dempster were laying themselves out in such a manner to meet the probable requirements of the future, it should inspire even greater confidence among the members of the two Associations as to the activities in the gas industry. No better testimony than the remarks of the Chairman of the Elland Gas Company could have been paid the firm, for no doubt a great part of the efficiency of the gas-works was due to the plant supplied by them. The waterless gasholder had aroused a great deal of comment; and no doubt the backing of a firm like Messrs. Dempster would assure a great future for this new development. He thanked the firm for their generous hospitality.

Mr. E. J. King, responding on behalf of the firm, said they were pleased to have the members of the two Associations there that day. The application for the visit was received during the régime of Mr. J. W. Broadhead, who had at once agreed to it; and it was a matter of great regret that Mr. Broadhead was not there to see the enthusiastic group of visitors. They in Elland felt they had lost a very good friend in Mr. Broadhead, for during his time the firm had developed considerably. Last year was difficult owing to the coal strike; and even now they had hardly recovered, as the getting of raw materials had not become normal. Regarding the waterless holder, they were one of the licencees in this country; and as one of the pioneers of the spiral-guided holder, they hoped great things for the waterless holder. It had certain advantages—low capital cost, especially when not above 1 million capacity, less time to erect, constant pressure, no water to freeze, drier gas, larger capacity on the same ground, easy to enlarge, and other advantages—over the spirally-guided type. Nearly 80 waterless holders were erected or in process of erection on the Continent and in the United States, and already three orders had been placed in this country.

AT THE WORKS OF ROBERT DEMPSTER & SONS, LTD.

Luncheon over, the party was conveyed from the Constitutional Club to the works of Robert Dempster & Sons, Ltd., where (as during the morning visit) every endeavour was made to render the occasion enjoyable, instructive, and interesting to all.

The party was divided into nine groups, each in charge of a guide, and "Conducted Tours" were taken to all departments—thus giving every opportunity of seeing the tremendous variety of work which constitutes what is known as the "heavy section" of gas engineering.

History of Progress.

It was interesting for the juniors to learn that the founder of this great enterprise was Robert Dempster, the first Gas Engineer of the Elland Gas Company. The firm—one of the oldest—is likewise one of the largest in the service of the gas industry. Historic examples of their early work were shown; among them being gas-meters made by Robert Dempster in 1850. Also (acting as a name plate on the office buildings) is an old-fashioned lime-luted retort-lid, made by Dempsters in 1858.

Modern Machinery and Skill Behind It.

Our fathers spoke of the number of hands, as a guide when describing the size of a works. To-day, modern method is intensive manufacture by machinery; the number of hands is no longer exactly a criterion of the capacity of a works. With mass production, the magnitude of a works depends upon a factor which might be stated thus—

$$\frac{\text{Mass of modern machinery}}{\text{Skill behind the machines}}$$

The exhibition of so many high-speed modern machine tools, coupled with the precision and rapidity with which the various operations were performed, proved an endless source of interest to the visitors, and demonstrated that $\frac{\text{Man}}{\text{Machine}}$ is the keynote of efficiency, and the keystone of future progress.

Rosemount Iron-Works.

'Tis not in vain that the name "Rosemount Iron-Works" conjures the imagination to the linking together of the beauty of the countryside with the industry of an iron-works. For, in truth, this hive of industry of Messrs. Robert Dempster & Sons, Ltd., nestling so comfortably in the folds of the green hills, is a veritable picture. It is approached through districts bearing the sylvan names of West Vale, Birchencliffe, and over the River Calder; and its position is dominated by the Ainley Hills (a spur of the Pennines), towering above the works some 350 ft., reaching to 650 ft. above sea-level, so that a bird's-eye view is always available. The works themselves occupy 12 acres of flat land; and with an optimistic foresight for the potential growth of the gas industry, and indirectly the firm itself, all the remaining flat land in the vicinity has been purchased, bringing up the total acreage to about 28 acres. The fringe of land without the works proper and skirting the slopes of the background of hills is at present utilized for recreation and allotment gardens for the employees.

The poetic comparison does not end here, for the founding of the firm in 1855 was contemporary with the poetic life of the district; this countryside being sufficiently neighbourly to be included in Bronteland. It would seem very appropriate to the visit of the Junior Gas Engineers to-day, on whom rests the chief onus for ridding our atmosphere of smoke, and thus let in the balm of sunshine to industrial Britain of the future, that, as long since as 1848, that literary genius Charlotte Bronte—speaking, if not of Elland, then of one of Elland's near neighbours—wistfully said:

> "I saw the pretty South of England village, so different from our Northern congregation of smoke-dark houses clustered round their soot-vomiting mills."

Thus, throughout this 70 to 80 years, this dreaded soot-vomiting has gone forth, to devastate the country, and to weaken human life and human endeavour. Yet as a rainbow in the sky, there is a promise of a better and brighter future; for even to-day on the slopes of the hillsides surrounding Rosemount Ironworks, it is still possible to gather a handful of wild raspberries. Thus may the visit to-day of the combined forces of Lancashire and Yorkshire Junior Gas Engineers be a War for the Roses—*i.e.*, such a development in the efficiency in use of gas that it will not pay to burn raw coal, and build ugly soot-vomiting chimneys, and that roses, those heralds of health and human delight, shall again bloom both on the cheeks of children and on the face of our beloved countryside.

Working Models and Descriptive Models.

The models shown to the visitors were greatly appreciated, and proved of great advantage in demonstrating the firm's

specialities in the brief time at disposal. Explanatory of the progress of the machinery of carbonization, there were: *From the year* 1904—Working models of projector stoking-machine, the first British machine to stoke 20 ft. through horizontals. *From* 1908-1910—Working models from the pioneer experiments in the production of the "Elland" system of intermittent vertical retorts, comprising interesting single-pull self-sealing lids for the mouthpieces. Charging shoots which, with uncanny simplicity, built porous charges to relieve gas pressure from the bottom mouthpiece, and automatically gauged them to the capacity for coal of the particular retort, regardless of the extent of scurf deposit. *From* 1911—A glass working model of a Dempster-Toogood continuous vertical retort, clearly showing the characteristic physical condition of the charge in its gradual descent down the retort, the operation of the central feed, and its effect on the phenomenon of the segregation of the coal; also the effect of the reciprocating coke-extracting gear on the discharge of coke. The retort, being of glass, enabled all flues to be visualized. A complete model setting of verticals in three-ply wood, each horizontal board representing 6 in. of brickwork. The building-up of the model in a few minutes is virtually the same as building the real setting, as every flue, damper, and burner is clearly reproduced.

A delicately poised model demonstrated a surprisingly natural phenomenon, that the weight of a charge in an outwardly tapering and smooth vertical retort does not act downward save for an infinitesimally small percentage of the weight. The ascertainment of this fact enabled the first detail (1911) to be so accurate, that it is still working after sixteen years of continuous night and day operation.

Modernized Horizontals.

Large-scale models demonstrated the method of absorption of the growth of silica within a firebrick setting. Also the latest flat bench cover recently patented, whereby the main arch is totally obviated, and the upward lift of silica settings automatically accommodated, with an actual reduction in first-cost of installation.

Non-Clinkering Screen-Bar-Grate.—A pretty model made wonderfully clear the simple means by which such totally different results are achieved in the burning or gasifying of coke, as seen on the six years' old pioneer screen-bar grates at the Elland Gas-Works.

Two-Ply, Two-Row Tubular Regenerator.—A model section of a horizontal setting cleverly portrayed the descent of waste heat and the ascent of secondary air within the setting; and the advantage of the two-ply thin divide between the contra-flowing streams, which, by the added air-tightness, reduces the insidious small losses of leakage, whereby regeneration is much increased. This, in conjunction with the thin divide made permissible by this construction, ensures the maximum regeneration in a given space; and the rarefied air rising through the deep regenerator finds its way, by its own buoyancy, into the combustion chamber, even though the same may be under pressure.

Insulation.—A demonstration was given of insulation plugs and bricks, though red hot at one side, being capable of being held in the hand at the other, thereby, in a convincing manner, bringing out the boon of increased insulation of retort settings.

Though numerous other models were on view, the space available prevents a lengthy description. Suffice it to say that there were a model of a new stoking-machine to discharge and charge a horizontal retort full; a gravity bucket conveyor (non-spilling between buckets); automatic oiler for conveyors generally; model grabs, ropeways, telphers, auto cut-outs, and lastly the firm (to augment the interest of their guests) had on view the model of the tankless gasholder, so that the latest topic among gas engineers could be discussed.

Environment of Works.

The surrounding hills abound in Yorkshire silica and fireclay of world-wide fame. The smoking chimneys on the hill-tops demonstrate, first, that raw coal is consumed to burn the bricks, and, secondly, that the burning of bricks ought to be by gas or coke, so as to arrive at a *quid pro quo*—gas-works bricks burnt by gas-works coke.

The locality is well served by L.M.S.R. (the old Lancashire and Yorkshire line—main line Manchester to York), and Dempsters' works are situated half-way, by road, between Halifax and Huddersfield, being served by a 3½ miles tram route from either town.

Offices.

It was seen that the suite of offices (built in 1903), to accommodate a staff of 100, are well-appointed, comfortable, and accommodate on the ground floor the commercial staff, and on the upper floor the technical staff. The Managing Director's office presents a veritable portrait gallery of gas engineers of note within the gas industry. Photographs also commemorate a disastrous fire to part of the works in the year 1902; but Phœnix-like finer accommodation arose from the ashes of the conflagration.

Pattern Shop.

Every wood-working device and machine for expediting pattern-making seemed to be in evidence; but the most impressive feature was the three large pattern stores, each much larger than the pattern shop itself, which had in the long years produced this multitude of patterns. The several stores were packed with every conceivable size and shape of pattern—all lettered and indexed, and ready for use. Such a stock gives utmost facility for speedy replacement of castings, and enables the firm to meet the maximum variety of castings with utmost economy in both time and money.

Foundry.

This foundry for many years held the pride of place among Yorkshire foundries, because of its semi-circular glazed railway-station type of roof, which gave such light and airiness to the otherwise dark and hot work of moulding. The foundry is served by a 20-ton and a 10-ton electric crane. Many varieties of castings for gas-works equipment were in process of being moulded.

Here again the foundry which has concentrated on gas-works' requirements for so many years has accumulated such an array of moulding boxes and tackle as greatly to accelerate and economize the production of gas-works present-day castings.

Fitting Shop.

This was built as recently as 1912; and therefore is on the most modern lines. The heavy tools are grouped in the centre bay, which bay is served by two high-speed overhead electric cranes, 10 and 5 tons respectively. The side bays accommodate the smithy, fitters' benches, and light turret lathes. The power is generated by gas-engine. The line shafts turn in ball bearings, but most of the heavy modern machines, boring mills, &c., are driven by a self-contained electric motor. The body of the shop was filled with current contracts comprising several telphers, throw-off carriages for belt conveyors, gravity-bucket conveyor parts, appurtenances in connection with continuous vertical retorts, horizontal retorts, and parts in connection with the low-temperature installation of which the firm are sole contractors, &c.—the whole making an interesting display.

Planing Shop.

The old fitting shop has been converted to a planing shop. At the time purifier plates, valve bodies, &c., were being planed; and interest was shown in the quick-return electric-driven planing machines, and especially in the time-saving devices of two tables per machine.

Valve Stores.

Standard valves are made for stock in large variety, so as to fulfil orders with dispatch.

Constructional Department.

This huge shop was built in 1914, and is a monument of foresight and application to economize time and effort in the production of constructional steelwork. The magnificent building is 40 ft. high, is in three bays, and the roof is of steel (Belfast type), glazed as much as possible, so that the shop is particularly light and spacious. It is served by no fewer than seven high-speed electric travelling cranes, varying in capacity from 10 to 5 tons, and all of 62 ft. 6 in. span. Modern machine tools, too numerous to mention, were on every hand.

The drilling bay—having assembling rails on each side, so that there is no lost time of the actual drilling while assembling the work—was particularly interesting, and showed that most holes are drilled, so as to ensure high-class work. Interest was evinced in the modern plate scarfing-machine, which permits of making perfectly water-tight joints at the corners of tank plates. The plate stretching machine which takes hold of the plates, and under hydraulic pressure stretches them to the perfect flatness of glass, proved interesting, and showed the care taken to ensure high-class work. Oxy-acetylene and quasi-arc cutting and welding plants were grouped in several parts of the shop.

For gasholder construction, most interesting and special machines were shown, punching up to as many as 120 holes at one stroke in gasholder sheets—thus ensuring perfect alignment of the millions of rivet-holes in large gasholders. For the heat treatment of metal, large bar furnaces heated by producer gas were seen; the gas being generated from gas-works coke, and the atmosphere of the interior of the furnace being regulated to reduce to negligible quantities the oxidation and scale of the heated bars.

The power for the shop is by gas engine; all shafting running on ball bearings. However, many scattered modern machines throughout the shop are direct-driven by self-contained electric motors.

Erecting Bay or Assembly Shop.

This is the latest addition to the works, and is filled at all times with the assembly of elevator framings, tanks, hoppers, and such construction. The far end is used as a local template floor; and the whole area of the shop is covered by two high-speed overhead cranes, which greatly facilitate the work of assembly.

Other Centres and Points of Interest.

The template shop is overhead, and the whole floor is virtually one huge drawing-board, where the details of steel-

work are set out full size, and templates made for the accurate holing of the parts.

Various stores are scattered adjacent to the big shops throughout the works; but the main stores (built in 1914) is at the entrance-gates. This is a three-storey building, and upwards of 600 tons of rivets, bolts, and small requirements are always kept in stock in their respective bins.

The firm manufacture their own water gas from gas-works coke, and store it for the gas-engine in a spiral holder near the Sports Fields. Over and above the gas-engines serving each shop, owing to the great development of the firm's requirements for power, caused by installing in recent years so many modern machines having direct coupled motors, it has been necessary greatly to increase the electric energy in the works. The firm receive the current at 10,000 volts alternating current from the Yorkshire Electric Power Company. This is converted through a transformer and rotary converter to 480 volts direct current for the works' supply, or to any intermediate pressure for testing any apparatus being manufactured.

Hydraulic power is available in all shops at 1800 lbs. pressure per sq. in.; and pneumatic tools at 130 lbs. pressure serve all shops.

Constructions to be riveted are moved about with surprising ease on the roller-bearing trolleys, so that the hydraulic riveters rivet almost any shape of apparatus with great facility.

The lay-out yards are spacious and conveniently placed to serve the shops. Huge trammels serve to ensure perfect circularity to the erection of rings of gasholder curbs, cups, and dips.

The yards are served by travelling steam jib-cranes on standard gauge tracks; and in convenient positions are grouped tool stores, brick stores, and open erection sheds fitted with handy tools and cranes.

The Sports Fields are beautifully situated at the foot of the green hills, and look very picturesque. There is a fine bowling-green and pavilion, cricket ground, football ground, and tennis court, so that all choice of sport is available for the employees.

Leaving the works at about 4.45 p.m., the party adjourned to tea at the Constitutional Club, when many expressions of appreciation were given of what had been seen during the day.

On returning to the Conservative Club, Elland, the visitors partook of tea as the guests of Messrs. Dempster.

Mr. W. H. Handley acknowledged on behalf of the firm the thanks of the two Associations.

THE BELGIAN GAS INDUSTRY.

[M. Eg. Adry, for the Antwerp Chamber of Commerce Yearbook, prepared an excellent propaganda article for the Belgian gas industry. References to the English coal strike, and to the International Gas Exhibition in Antwerp, were included; and a translation of these is given below.]

The Belgian gas industry generally, and in particular his undertaking, the Antwerp Station of the Imperial Continental Gas Association, are indebted to that eminent historian and propagandist, M. Eg. Adry, for an interesting article in the 1927 Official Yearbook of the Antwerp Chamber of Commerce. M. Adry, it will be remembered, was the author of "Un Siècle d'Eclairage," a scholarly yet entertaining history of gas lighting, which was published in commemoration of the centenary of gas in Belgium.

The "Annuaire Officiel" of Antwerp is a well-printed volume of 200 pages containing a mass of information which must prove of great value to buyers and sellers alike; and the case for gas is most adequately put forward in M. Adry's six pages of type and illustration.

The main part of the article is naturally devoted to the manifold uses of town gas in the home and in industry, and calls for no comment here beyond the remark that the Antwerp Undertaking would appear to be a worthy model to the great majority of continental gas suppliers. A few extracts from the more general information supplied by the author will, however, be read with interest in this country. For instance, he lays down that "the least economic crisis in a country finds an immediate echo in the gas industry, whose prosperity follows, in a faithful curve, the ups and downs of the nation's prosperity. All the celebrated economists—Laveleye and Strauss, among others—have taken this fact as axiomatic."

Referring to the coal strike in England, M. Adry gives us a further insight into the widespread trouble wrought by our extremists. Rarely, he says, have all industries, and especially the gas industry, found themselves in a more difficult position—at times even alarming. At one period the coal stocks of Antwerp factories were so depleted as to give rise to grave fears of having to close down; and the Authorities felt bound to consider the advisability of rationing the supply of gas both to private consumers and for public lighting. Happily, thanks to energetic measures, and an admirable organization and initiative, the Association's officers were able to tide-over the crisis—so successfully that no single consumer was aware of the gravity of the situation.

At the end of his essay, the author refers again to last year's International Gas Exhibition in Antwerp, which, he affirms, "eloquently gave the lie to those who like to picture the gas industry as an eternal moribund, and was startling testimony to the health of an industry more than a hundred years old, but which is indispensable in all walks of life." In opening that exhibition, M. Arthur Wauters, Chef du Cabinet, said the Government "could not remain indifferent to such a remarkable economic manifestation," and went on to point out that Belgium possesses 58 gas-works carbonizing 800,000 to 900,000 metric tons of coal per annum, and producing 300 million cub.m. [10,594½ million c.ft.] of gas, 400,000 to 500,000 tonnes of coke, 40,000 to 45,000 tonnes of tar, and 9000 tonnes of sulphate of ammonia. The capital engaged amounts to nearly 1 milliard francs [40 million pounds sterling at normal rate], and employment is given to 9000 workmen.

M. Adry closes by recalling with pride the statement of M. Lebon, an Alderman of the city, at a function during the exhibition. M. Lebon remarked that the City Corporation were happy and proud to look back upon eighty years of intercourse with a Company whose tact, wisdom, and breadth of outlook were acknowledged by all, and this under the management of such a man as Mr. Hayman, who had attracted universal goodwill and was counted no longer as a stranger, but as a great friend of the Metropolis, whose freedom he fully merited.

PROPOSED NATIONAL FUEL RESEARCH BOARD OR COUNCIL IN AMERICA.

In the "Journal" for Jan. 19, an editorial article appeared on the subject of "A Fuel Council." This has interested Mr. F. R. Wadleigh, of the Broadway, New York, in view of the fact that preliminary steps have been taken for the organization in the U.S.A. of a National Fuel Research Board or Council. Recommendations to this effect have been submitted to the American Society of Mechanical Engineers by its Fuel Research Committee, of which Mr. Wadleigh is Chairman.

The following extract from the "A.S.M.E. News" gives an idea of what is proposed.

> In a brief statement regarding the proposed plans of the Survey Committee, Mr. Wadleigh, the Chairman, wrote: "All users of fuel, as well as the fuel industries themselves, must recognize the practical financial value of well-organized and properly directed research, together with the fact that every new use of coal or other fuel has been brought about by discoveries of the scientific research workers. In order to increase interest in fuel research, and to bring about a much-needed co-ordination of the various activities in this field—especially those undertaken by the various technical and industrial organizations—a movement has recently been started by the Fuel Research Committee of the American Society of Mechanical Engineers to bring about the organization of a National Fuel Research Board. It is expected that all the leading technical societies, together with the U.S. Bureau of Mines and Bureau of Standards, and the national trade and commercial bodies, will be represented on the Board. Especially is it hoped that the national and other coal associations should aid in this movement, which, it is believed, can be made of great benefit not only to the coal industry itself, but to every consumer as well. The great value of active, co-ordinated fuel research is fully recognized in foreign countries, perhaps to a greater extent than in the United States. Evidence to this effect is found in the 1926 report of the British Royal Coal Commission, a whole chapter of which is devoted to fuel research. In this country, comprehensive and systematic plans for fuel-research activities are much needed; and it is thought could be better formulated and made effective by a combination of all fuel-research work, rather than through single individual or association efforts."

Mr. Wadleigh has taken up the whole matter of fuel research, and the need for correlation and co-ordination of fuel research activities with the leading technical schools and individual engineers in the country, as well as with a number of British technical men—including Dr. Lander, Dr. Lessing, Prof. Bone, and others. It seems to him that this is a subject which those interested in both countries would be willing to develop; and he is hoping to obtain the help and co-operation of technical men in Great Britain.

UTILIZATION OF GAS COKE.

By E. W. SMITH, D.Sc., F I C, Technical Director, Woodall-Duckham Companies.

Extracts from a Paper read before the Royal Society of Arts.

IN the theatre of the Royal Society of Arts, John Street, Adelphi, on Wednesday evening, March 9, a paper on "The Utilization of Gas Coke" was read by Dr. E. W. Smith, before a large audience. Prof. ARTHUR SMITHELLS, C.M G., D Sc., F.R.S. (Director, Salters' Institute of Industrial Chemistry), who presided, said, in calling upon the author, that increasing interest was being taken in the subject which would be placed before them There was a strong public demand for further information; and it was very desirable that this demand should be gratified It was equally desirable that the information given should be accurate; and this would be the case that evening. Dr. Smith was closely identified with fuel questions, and would give them a valuable address.

Gas coke is known as a residual, though it is by far the most important residual. Six shillings a ton difference in the selling price of coke will affect the selling price of gas by about a halfpenny a therm. During the last two years, we have had presented to us a large number of technical contributions on the subject of coke—its formation, combustibility, reactivity, grading, quenching, and so on—but there is still a lot to learn. This technical activity has been stimulated largely through two or three causes—the public desire for smoke abatement, the activities of those engaged in the development of processes of low-temperature carbonization, and, because of the non-success of the latter commercially, an attempt on the part of those engaged in the well-established high-temperature carbonization industries so to improve the coke residue as to provide a solid smokeless fuel.

Already a great change is taking place in many gas undertakings. Attempts are being made to carbonize a greater proportion of low-ash or cleaner coals. More collieries are consequently installing coal cleaning plants, and in one case—Glasgow—a gas undertaking is itself arranging to clean its coals. In all such cases coke of lower ash content will be available. Methods of coke quenching are given more attention where static methods of carbonization are used; and with the enormous growth of continuous vertical retort practice, dry coke from such plants may be assured. Coke screening and grading is becoming common; and last, but by no means least, the appliances of all kinds in which coke is burnt are being modified and improved. The possibilities of such progressive development are observable in those large cities that have taken advantage of recent developments, when it is realized that the demands for the improved coke are so great that in some cases there is an actual shortage. The time may not be very distant when coke will take its place on an equal footing with gas in the economics of gas undertakings; and while periodic fluctuations in the coke demand can be taken care of by stocking, the seasonal excesses of gas, not accommodated by the holders, can be used for heating the carbonizing plants.

In fig. 1 you will find a list of the various uses for which one large provincial gas undertaking sells its coke. This undertaking has found it advisable to screen the make of coke into five sizes—above 2 in.; 2 in. to 1⅝ in.; 1⅝ in. to ¹¹⁄₁₆ in.; ¹¹⁄₁₆ in. to ⅜ in.; and below ⅜ in. It also endeavours to supply the coke in a dry state.

This instance is only one out of a number of gas undertakings where the importance is realized of embodying in practice the results of the investigations on coke quality now being carried out in several quarters.

THE OPEN GRATE AND ITS MODIFICATIONS.

The increasing price of coal of recent years has led to the substitution, in many instances, of the old-fashioned open grate with its abundance of iron bars, side and back plates, and its excessive air supply, by the slower burning semi-well and well grates. The back and sides of this type of grate are invariably of firebrick, and the front bars are absent. Gas coke, providing it is reasonably dry, and sized between 2 in. and 1⅝ in., may be burnt in any such grate which burns coal successfully. An illustration of an ordinary semi-well grate burning gas coke of this size is given (fig. 2). The grate is 16 in. wide at the front, and 11 in. deep from front to back. The coke may be ignited by paper and wood in the ordinary way, or by using a gas jet. Thereafter, all that is required is to keep the fire replenished, throwing the fresh coke to the back of the fire.

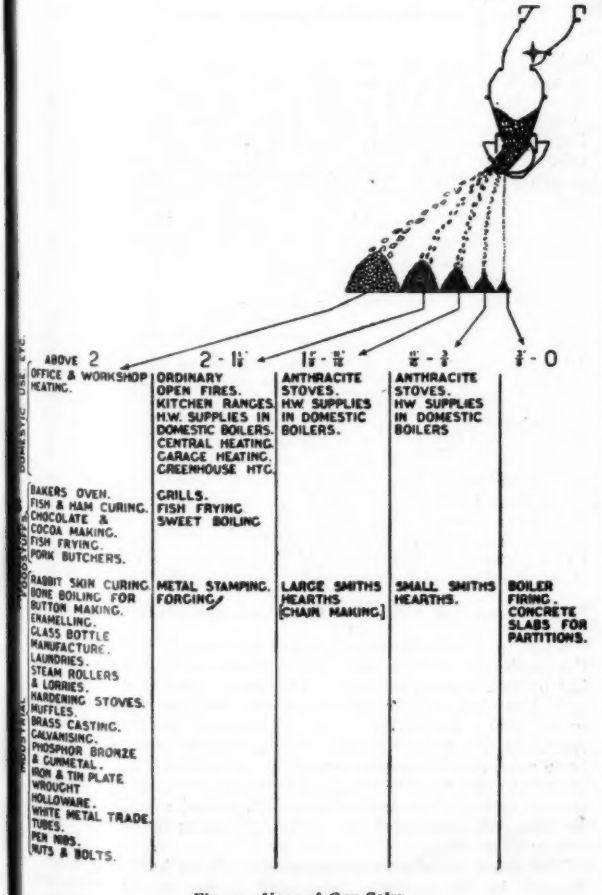

ABOVE 2
2 - 1⅝
1⅝ - ¹¹⁄₁₆
¹¹⁄₁₆ - ⅜
⅜ - 0
DOMESTIC USE
INDUSTRIAL USE
OFFICE & WORKSHOP HEATING.
ORDINARY OPEN FIRES. KITCHEN RANGES. H.W. SUPPLIES IN DOMESTIC BOILERS. CENTRAL HEATING. GARAGE HEATING. GREENHOUSE HTG.
ANTHRACITE STOVES. HW SUPPLIES IN DOMESTIC BOILERS.
ANTHRACITE STOVES. HW SUPPLIES IN DOMESTIC BOILERS
BAKERS OVEN. FISH & HAM CURING. CHOCOLATE & COCOA MAKING. FISH FRYING. PORK BUTCHERS.
GRILLS. FISH FRYING SWEET BOILING
RABBIT SKIN CURING. BONE BOILING FOR BUTTON MAKING. ENAMELLING. GLASS BOTTLE MANUFACTURE. LAUNDRIES. STEAM ROLLERS & LORRIES. HARDENING STOVES. MUFFLES. BRASS CASTING. GALVANISING. PHOSPHOR BRONZE & GUNMETAL. IRON & TIN PLATE WROUGHT HOLLOWARE. WHITE METAL TRADE. TUBES. PEN NIBS. NUTS & BOLTS.
METAL STAMPING. FORGING.
LARGE SMITHS HEARTHS (CHAIN MAKING)
SMALL SMITHS HEARTHS.
BOILER FIRING. CONCRETE SLABS FOR PARTITIONS.

Fig. 1.—Uses of Gas Coke.

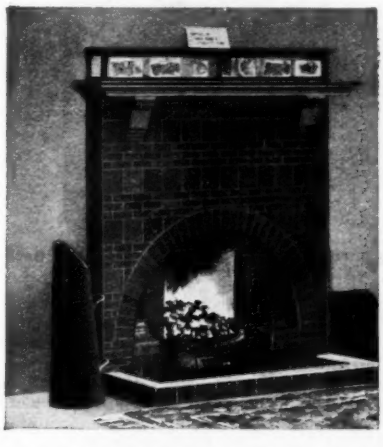


Fig. 2.—Standard Open Fire Burning Gas Coke.

It is desirable to avoid allowing the fire to burn too low. Dry gas coke graded to between 2 in. and 1⅝ in. will keep an ordinary sized room (12 ft. by 14 ft.) warm when burning at the rate of about 2 lbs. per hour, which, with coke at 40s. per ton, is equivalent to a cost of about ½d. per hour.

In this way, coke may be substituted for coal, in many instances with no structural alterations; the amenities of the open fire being retained. There is still a large number of instances where the utilization of gas coke may be extended in this manner; the chief obstacle, it must be admitted, being the difficulty in some cases of obtaining a dry coke suitably graded.

Progress is being made in the perfecting of fires of the open grate type specially designed for the burning of gas coke. The chief among these are the Hodsman fire, the "Glow-worm" open coke fire (Dr. Owens' patent), the "Rayflex" open coke fire (Dr. Weyman's patent), the "N.C." fire (Mr. Nicol's patent), and the new fire developed by the South Metropolitan Gas Company. In a recent paper Hodsman and Bligh described a fire in which the coke was held in a shallow though comparatively tall layer. Their experiments demonstrated the

importance of having refractory material at the sides and back of the fire, and the higher radiation efficiency when coke low in ash was burnt.

The "Glow-worm" Fire.—In the "Glow-worm" open coke fire the coke is held in the form of a vertical layer between widely spaced bars at the front, and closely spaced bars at the bottom and back. The fuel is fed through the canopy, which is hinged, and opens for this purpose. The ashpan acts as a damper; and when starting from cold it is pushed right back, and the air for combustion is drawn through the front bars, through the fuel bed, and up the back flue to the chimney. Under this condition, the whole of the chimney pull is utilized in drawing air through the fuel bed, and the fuel bed increases in temperature at a very rapid rate. To continue to drive the fire in this way at the full rate would lead to an unnecessary wastage of fuel. In fact, after a time, the excessive amount of cold air drawn through the front of the fire would actually cool the glowing surface, and the heating of the room would thereby suffer. By drawing forward the ashpan, the direction of the air current may be progressively diverted from the horizontal from front to back to the vertical from bottom to top.

After the fire has attained a useful temperature by means of the full draught, a position of the ashpan may be found which is just sufficient to maintain the fuel at that temperature. To preserve the ventilating effect of the ordinary open fire, an auxiliary opening underneath the canopy allows air to be drawn into the chimney by the ventilating action of the hot products of combustion; and thus the air of the room is changed sufficiently often to preserve its freshness. In the latest models, a control plate is fixed in this ventilating duct, so that the ventilating effect may be obtained without the persons in the room feeling "draughts." The fire is self-contained, and may be fitted in any existing open grate. It may also be built in the ordinary register and tiled surround, during the construction of new houses.

A still more recent development of the "Glow-worm" open coke fire is the provision of a boiler at the back for heating the necessary domestic supply of hot water (see fig. 3). The boiler is placed immediately behind the back bars, and thus the coke

Fig. 3.—"Glow-worm" Open Coke Fire with Back Boiler.

does not come into actual contact with the boiler. The coke may, therefore, attain a temperature greatly in excess of that of the boiler, and permit of any carbon monoxide formed being completely burnt.

This same type of fire is being developed as an inset fire which, while preserving the appearance of the open fire with its more nearly horizontal fuel bed, has the draught control obtainable with the standard "Glow-worm" fire. Coke of from 1 in. to 1½ in. is recommended for use in this fire, though the smaller sizes—bean, breeze, &c., may be employed. Household rubbish may be burnt. The small fire, when driven to the full, is stated to consume 2 lbs. of coke an hour, and when running at the normal rate 1¼ lbs. an hour.

The "Rayflex" Fire.—In the case of the "Rayflex" fire, the fuel is supported on inclined fire bars with a practically closed front. [An illustrated description of this fire appeared in the "JOURNAL" for Feb. 9 last, p. 322.] It is calculated that 55 p.ct. of the heat in the coke passes into the room by radiation, and 17 p.ct. by convection. There is no carbon monoxide in the waste gases. The size of gas coke recommended is ½ in. to 1 in.; but other grades varying somewhat from this may be used.

The "N.C." Fire.—The "N.C." fire is a simple modification of the ordinary open grate. It is in essence an open fire grate, the firebrick back and sides of which are made with a series of deep vertical grooves extending from the hearth level to a point above the normal level of the fuel in the grate. These channels act as miniature chimneys, inducing convection currents of air inwards through the fuel bed from the front to the back of the grate. Control is through opening or closing the fret in the ashpan cover—opening if the rate of combustion is to be reduced, and closing if to be increased. This grate, by removing the front bars, is converted into an ordinary semi-well grate, and is then suitable for use with coal or a mixture of coal and coke.

SLOW COMBUSTION STOVES.

Unless attention is given every two hours or three hours to the open fire and its modifications already dealt with, the fire will die out. I would direct your attention now to the slow combustion type of stove, which will burn continuously night and day. This class of stove is essentially useful for rooms where continuous warmth with a minimum of attention to the fire is required. Taking as samples of this type the "Esse" and the "E.M.J." (the latter illustrated in fig. 4), the coke bed is entirely enclosed in a cast-iron body, and rests on a bar grate which may be agitated to allow the particles of ash to drop into the ash box. An outlet flue fitted with a controlling damper is situated at the back, and leads the products of combustion into the ordinary chimney or a flue leading to the outside of the

Fig. 4.—"E.M.J." Slow Combustion Stove.

building. The ashbox underneath the grate is closed by a door in which is fitted an air regulator. The fuel is fed into the stove through a door at the top; and sufficient fuel may be charged at once for several hours' consumption. A special feature of the "E.M.J." stove is the provision of ventilating tubes at the back of the fire. These tubes permit air to be drawn directly into the chimney without passing through the fire, and thus a greater volume of air is drawn through the room than that required just to keep the fire burning. Gas coke graded preferably 1⅛ to ¼ in. is recommended, though smaller fuel—say, ⅜ to ¼ in.—can be used. The average coke consumption may be taken as about 1 lb. an hour, which at 40s. per ton is equivalent to about a farthing an hour. The only attention required is daily removal of the ash, which is effected by shaking the grate and then withdrawing the ashbox. Two, or at most three, fillings of coke per 24 hours are required.

These stoves heat the room by warming the air in immediate contact with the metal of the stove. The warm air commences to rise and a regular system of convection currents is set up which ultimately provide warm air in all parts of the room. A small amount of heat passes into the room by radiation from the incandescent fuel. Such stoves are made in sizes suitable for heating rooms from 1500 to 17,000 c.ft. in volume.

A large capacity warm air circulator—the "Minerva"—is suitable for heating from 30,000 to 200,000 c.ft. of air space. [This stove was described and illustrated in the "GAS SALESMAN" for Dec. 29 last, p. 302.]

HOT WATER FOR DOMESTIC PURPOSES AND HEATING OF ROOMS.

There are many forms of apparatus in which coke is used for the production of hot water for domestic purposes and for heating by hot water radiators. The larger sizes of boilers have a sufficient heating surface to provide the hot water supply for washing up, baths, &c., and, in addition, to heat one or two radiators for warming the house. In this case, it is usual to have a separate flow and return to the radiators. Where hard water is used, it is advisable not to pass the water for domestic supply through the boiler itself; otherwise, after some time of working, deposits may be sufficiently great to impede the efficiency of heating.

The most satisfactory arrangement is to heat the water indirectly in the manner illustrated in fig. 5. M is the coke boiler, on the left-hand side of which are shown the connections

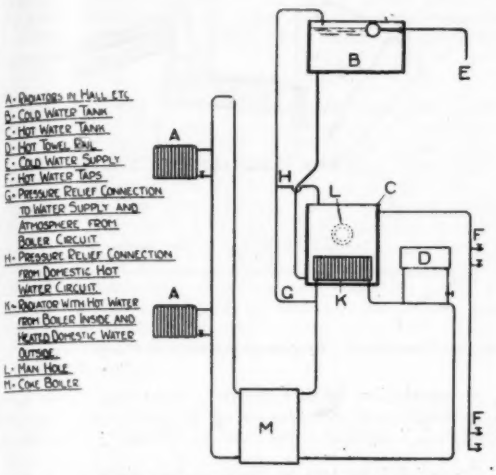


Fig. 5.—Domestic Hot Water System, showing indirect Heating of Tank.

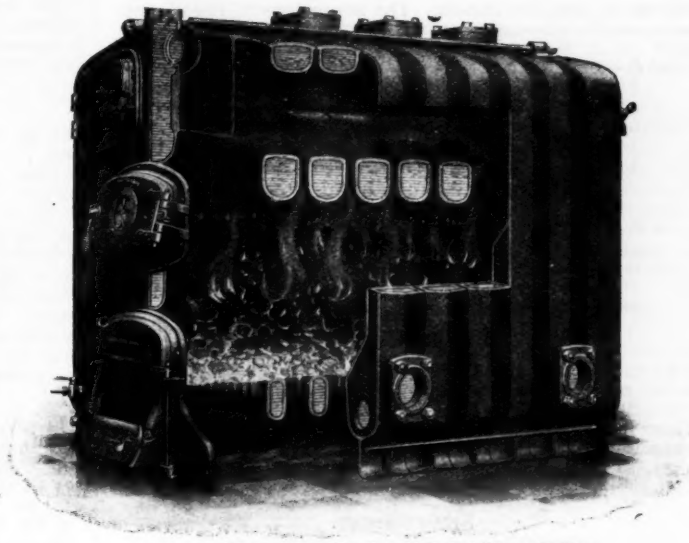


Fig. 6.—Ideal "Britannia" Hot Water Boiler.

for heating two radiators. On the right-hand side is the hot water supply system. The hot water from the boiler simply circulates through a radiator K placed in the bottom of the hot water tank C. This is a closed system, and no fresh water is ever passed through the boiler itself. The heat of the water in the radiator K is imparted through the metal to the water in the tank C, which is provided with a cold water feed pipe and a flow pipe to the hot water taps F. There is the usual vent pipe H, which is also connected to the boiler circulating system by the pipe G. Such an arrangement will supply all the hot water required for domestic use, and two radiators and a towel rail, by burning 2 lbs. per hour of 1-in. coke at a cost (coke at 40s. per ton) of 1s. per day. In addition, water may be heated in pans or kettles on the top of the coke boiler, and ordinary domestic refuse can be destroyed.

House Heating in the Future.

The best coke, properly graded, will give satisfaction in almost any domestic grate. An improved coke, such as I expect will be made at high temperatures in the not far distant future, will have all the desirable qualities of low-temperature coke without its disadvantages.

I am not satisfied with the average coke made to-day when used in the best type of standard grate; but little improvement need be made as regards combustibility or ignitibility when it is intended to use it in either the Owen type of fire (controlled draught) or in the enclosed central heating boiler. Much can be done in adapting equipment to burn coke. One factor of importance—provided for in such equipment, including the "Esse" type of grate—is that, as the coke burns, it moves, and the superficial ash is rubbed off each individual piece. Combustion is accelerated, and radiant efficiency increased. This is a defect of the static well-grate type of fire.

My ideal for house heating is a combination of hot water radiators and the radiant gas fire. When a coal fire is left last thing at night it serves a useful purpose in maintaining the temperature of the house overnight. Where gas fires only are used, and they are turned off last thing, it is probable that, when they are re-lighted, the walls of the room in mid-winter will be so cold that the fire will have to be going for some time before the general wall chill has been eliminated. Semi-central heating, in halls and on landings, will maintain the temperature of walls in living rooms as well as throughout the house, and the gas fire will provide that extra heat required in rooms occupied for longer periods. The coal fire has some good points, but its disadvantages outweigh these. Coke is preferable for hot water radiators and domestic hot water, on account of its freedom from smoke, and its low cost.

Heating Office Buildings, &c.

Large coke finds an admirable use in boilers of large size for supplying hot water to the radiators of large buildings. One such type is illustrated by the "Ideal Britannia" boiler (fig. 6). The coke is charged into a horizontal fire box entirely surrounded by water loops, which receive their heat partly by radiation from the glowing fuel bed, and partly from the hot gaseous products of combustion. The air enters through a controlled damper in the front of the ashpit, and the waste gases pass to the atmosphere through a flue at the back, fitted with a damper. The return enters at the bottom of the loops, and the flow is taken off at the top. These may be connected to the radiators of the ordinary type in different parts of the building, by any of the usual systems of piping.

I would, however, call your attention briefly to a system of heating which is finding considerable favour in new buildings. This is illustrated in fig. 7. In place of the usual loop radiators, which occupy space, are difficult to render æsthetic in appearance, and heat the air of the room by creating convection currents of air, a series of small-diameter pipes embedded in the ceilings or the walls of the building are connected with a number of flow and return pipes. The small pipes heat the ceiling or wall in their immediate vicinity, which forms a warm "panel" from which the heat is transmitted to the occupants by radiation, and not by convection. A. H. Barker has very fully described the underlying principles of this system. In the illustration, it will be observed that the main flow pipe is taken vertically to the top of the building, and thence round the top floor. At suitable intervals, flow pipes are taken down to the bottom floor, but are not connected directly to the return. At the level of each floor, a connection is taken from these descending flow pipes to one end of a ½-in. pipe, which is embedded in the floor, occupying a panel 4 ft. wide, from the wall inwards. The other end of this pipe is connected to one of a series of return pipes which lead into the main return pipe. A variable speed circulating pump keeps the hot water in circula-

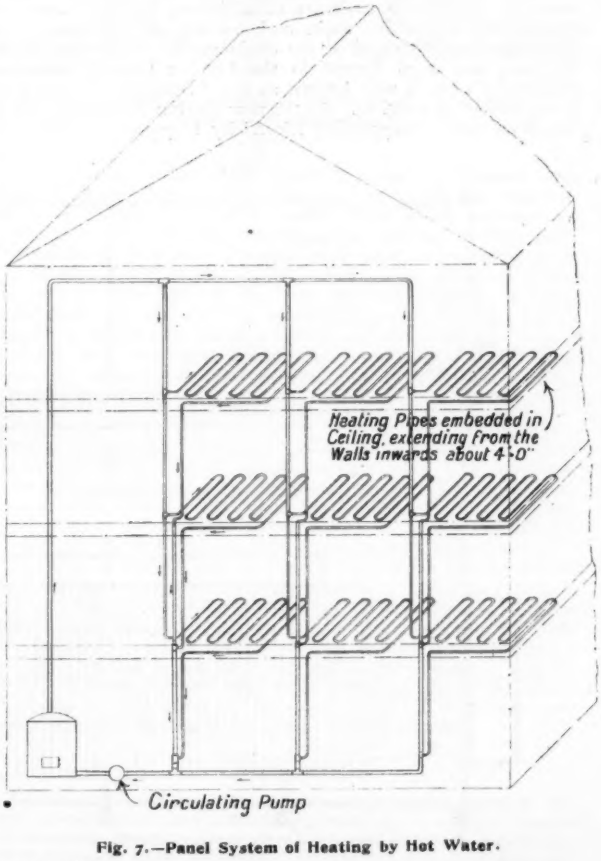


Fig. 7.—Panel System of Heating by Hot Water.

tion throughout the system. The advantages of this arrangement may be summarized as:

(*a*) A considerable area of ceiling and floor is warm; and the heat radiated from these provides an agreeable sensation of warmth without stuffiness.
(*b*) There being a considerable mass of material at an elevated temperature, sudden changes in outside temperature have little or no influence inside. Conversely, this fact is a disadvantage if the circulation is not kept reasonably constant, as the response to quicker firing is rather slow.
(*c*) No unsightly radiators are visible, with a saving in ground space.
(*d*) It is claimed that only one-third the radiating surface is required as compared with the radiator system; and there is thus considerable saving in fuel.

COOKING BY COKE.

In concluding the review of the domestic uses of coke, I would refer to what may be termed the "coke kitchener," as exemplified by the "Ideal Cookanheat," "Kooksjoie," &c. These are self-contained, requiring no back setting. They comprise a fire with water boiler, a cooking oven, and a hot-plate. The boiler may be of sufficient capacity to heat, in addition to the water for ordinary use, one or more radiators.

STEAM RAISING.

While there is a ready sale for the various screened sizes of coke from ⅜ in. upwards, there is a residuum of coke, known as unscreened breeze, which gas companies are willing to dispose of at lower prices. It is being realized that coke breeze, when burnt on a suitable grate, forms a very cheap fuel for steam raising, and that it pays to instal grates of a type which will successfully handle this fuel. Not only is the saving due to the low price of the coke breeze, but there is an increase in the thermal efficiency of the boiler due to the absence of volatile matter in the breeze, which makes it possible to work the boiler with a reduced amount of excess air, and eliminates all possibility of black smoke being emitted into the atmosphere. To burn coke breeze successfully requires, in the first place, the fuel bed to be not too thick; secondly, the air to be introduced under the fuel bed under pressure; and, thirdly, that there should be uniform distribution of the air.

For hand-fired furnaces, special grates, such as the Wilton (fig. 8) and "Turbine," are available. The air for combustion is injected by means of steam jets under specially arranged fire bars, which are arrayed so that each part of the fuel bed receives a uniform supply of air.

With chain-grate stokers, as such, only partial success has been achieved in burning coke breeze. Even with intimate mixing of the breeze and coal, this was experienced; the chief difficulty being that the non-volatile breeze, which generally contains appreciable amounts of moisture, had the effect of cooling-off the ignition arch, and causing unburnt coal to be discharged over the end of the chain grate. E. W. L. Nicol, Engineer and Fuel Expert to the London Coke Committee, introduced what is now known as the "Sandwich" system of firing boilers (see fig. 9). At the new Barton Power Station of the Manchester Corporation Electricity Department—the most

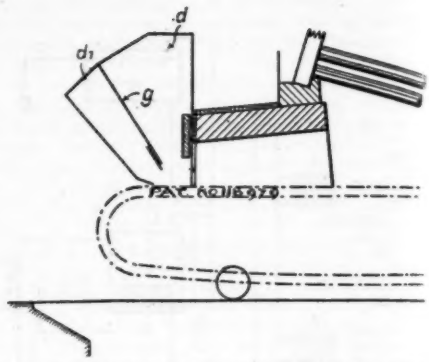


Fig. 9.—"Sandwich" System of Burning Coal and Coke.

efficient power station in this country, according to the Electricity Commissioners' Report—using 50 p.c.t. coke breeze on the "Sandwich" system, the over-all efficiency obtained is 84·2 p.c.t.

The "Sandwich" system is an extremely simple adaptation of the well-known chain-grate mechanical stoker. Instead of the usual single coal chute, two chutes communicate with each mechanical stoker, and with separate coal and coke bunkers overhead. The outer chute feeds the coke breeze, which is carried into the furnace in a 6-in. layer "sandwiched" between the chain grate and an upper layer of coal slack fed from the inner chute—thus utilizing, instead of relatively high-grade washed coal, two low-grade fuels in their natural untreated condition.

It has been stated, by one user who has consumed over 300,000 tons of breeze, that only by means of the "Sandwich" system can the very friable coal slack from the Kent coalfield be utilized economically on chain-grate stokers—a matter of great economic importance bearing upon the development of London's nearest coalfield. There are, of course, mechanical stokers which burn coke and coke breeze without the admixture of coal; but it is significant that these are being adapted to operate upon the "Sandwich" system, with a view to utilizing also very low-grade coal which is otherwise considered unsuitable.

COKE BREEZE.

This outlet for coke breeze is also of great economic importance to the gas and coke-oven industries. Coke breeze, which is unavoidably produced to the extent of about 10 to 12 p.c.t., has hitherto been used almost exclusively for steam-raising in the gas and coke-oven industries; but waste-heat boilers are now largely being adopted, especially in gas-works. The coke breeze thus released now finds a ready and convenient market, and forms an important source of additional revenue to the gas undertaking; the double economy thus effected tending to reduce the price of gas to the public, while, at the same time, adding another source of fuel supply to the electric supply industry. During the war, and throughout the recent coal

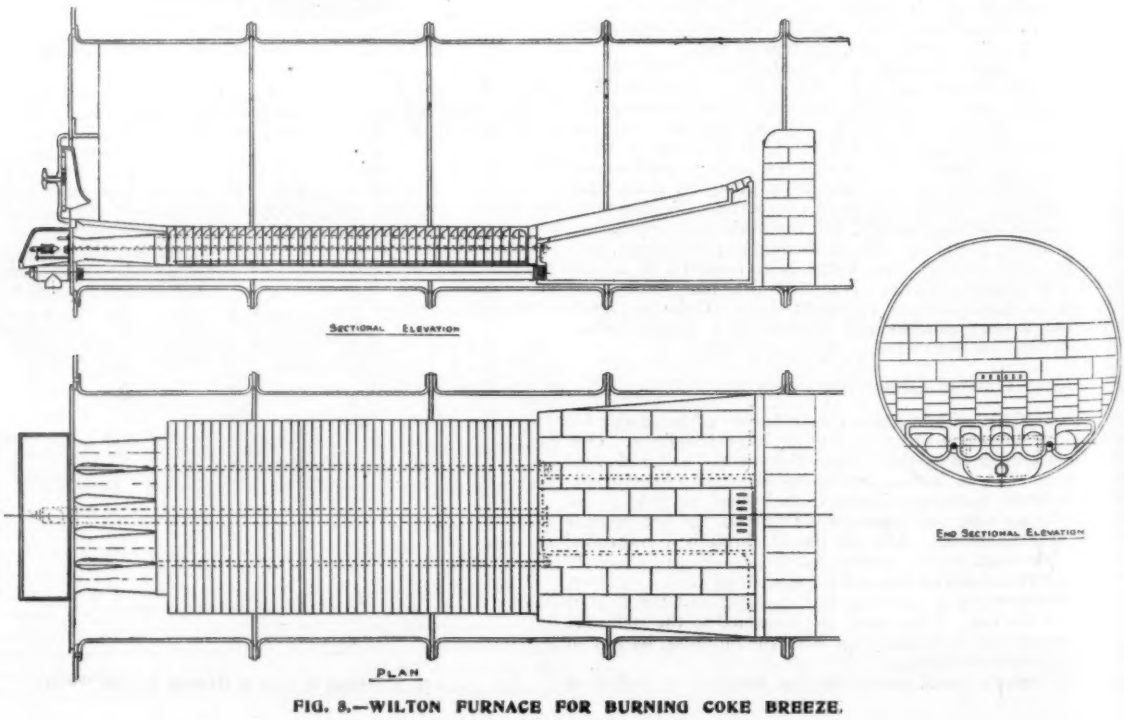


FIG. 8.—WILTON FURNACE FOR BURNING COKE BREEZE.

stoppages, coke and coke breeze, used on the "Sandwich" system, helped materially to maintain public electric services, for great quantities of gas coke and breeze were used—some of the latter from dumps which had been in existence for over fifty years.

STEAM LORRIES.

Two or three makers of steam wagons, such as the "Garrett," "Atkinson," "Sentinel," "Yorkshire," and "Leyland," provide special facilities for using coke only as fuel. With coke at 45s. per ton, a 6-ton "Sentinel" wagon, fully loaded, averages 15 miles per cwt. of coke, which is equivalent to less than 2d. per vehicle mile, or about ½d. per ton mile. The gas coke most suitable for this class of work is coke broken to about 2 in. size, which is available at about 1600 gas-works in city, town, and village throughout the country. In London and the Southern districts, there are many wayside depôts organized by the London Coke Committee. The coke-fired steam wagon is, in general, the cheapest form of road transport for heavy haulage. Combustion is, of course, entirely smokeless.

COASTING STEAMERS.

The use of gas coke in coasting steamers is a departure of recent years. Mr. E. V. Evans, Chief Chemist to the South Metropolitan Gas Company, has kindly given me the following notes on this Company's experience with gas coke as a boiler fuel on coasting steamers.

The use of coke as a boiler fuel in the South Metropolitan Gas Company's steamships was first introduced in March, 1925; the decision to make this alteration being largely influenced by the desire to assist in the smoke abatement campaign, particularly in relation to the River Thames. As was only to be expected, certain difficulties were encountered, when the change-over from coal to coke was made; but these have now been overcome, and the results after two years' working are entirely satisfactory. . . . The increased wear and tear of firebars resulting from the use of coke fuel was one of the most difficult problems encountered. . . . The type of coke used is No. 1 broken coke, size 1 in. to 2 in. The material is easy to handle, and generates steam with a minimum of exertion on the part of the stoker. It may be pointed out that stoking should be effected by filling in towards the back bridge and tapering towards the front dead plate; this procedure being exactly opposite to that employed with coal fuel. . . . A comparison of the working results with coal and coke shows that, as far as speed is concerned, there is very little difference with the two fuels. With regard to fuel consumption, coke would appear to be slightly more economical than coal; the average figures for a round trip of five days being: Coal 58·18 tons, coke 55·99 tons. Since the adoption of coke as a fuel, it has been possible to reduce the number of stokers actually employed on the fires from five to four. There has been no reduction in personnel, however; the extra man being employd in the engine room. The result is a considerable increase in the cleanliness and efficiency of the stokehold and the engine room. . . . The advantages and disadvantages of coke when compared with coal are briefly as follows:

ADVANTAGES.

1. Entire absence of smoke.
2. Cleaner stokehold and engine room.
3. Reduction in stoking staff.
4. A slight reduction of fuel as compared voyage by voyage.

DISADVANTAGES.

1. Extra consumption of firebars.
2. Extra space required for bunkers, coal occupying 45 c.ft. per ton, and coke 80 c.ft.

PREPARATION OF FOODSTUFFS.

This industry, which touches one of the most intimate sides of our life, is represented by the use of gas coke in bakers' ovens. Fig. 10 shows a "Baker Perkins" steam-heated automatic bread baking oven. The heating is carried out by surrounding the baking chamber with steam loop tubes in which water is evaporated under pressure. The necessary heat is supplied by burning large gas coke screened over 2 in. You will observe the furnaces at the lower part of the illustration.

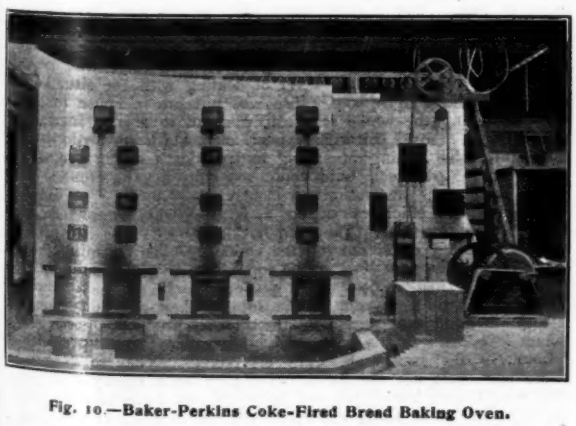


Fig. 10.—Baker-Perkins Coke-Fired Bread Baking Oven.

Since baking operations are carried out at comparatively low temperatures, steam is a convenient means of obtaining such temperatures without the oven being overheated in any part; and, under normal conditions, firing by gas coke is the cheapest means of obtaining the steam.

Probably the enormous extent of the fish frying trade is not fully realized. About 5000 tons of fish per week finds its way, accompanied by the ubiquitous "chips," to the supper tables of our country. Large coke screened over 2 in. is a suitable fuel for heating the frying pans of the fish shop. The advantages of coke as against coal, apart from its price in this connection, are its freedom from smoke and its comparative cleanliness. It should, however, be stated that the superior advantages of gas, even at a higher cost, are being realized, and in many cases all forms of solid fuel are being displaced.

Wherever small or large furnaces are required for heating purposes, large coke finds a very useful application. The smaller sizes of screened coke are in many instances applicable. The fuel *par excellence* for the smith's hearth is a washed breeze, either 1 in. size for the larger type of hearth, or about ½ in. for the smaller.

Referring to the use of coke for gas-making, the author illustrates the step-grate producer which is installed in Woodall-Duckham gas making plants (fig. 11). The grate is in the form of a series of steps of iron plates, which are kept cool by a trickle of water. The coke, which is generally screened large coke, is charged through the door in the top of the producer, which is always kept full of coke. The active incandescent fuel bed is that between the step-grate and the curtain arch. The producer gas formed is drawn-off under the curtain arch, and is distributed to the various combustion chambers round the retorts. The air for producer gas manufacture is introduced under the step-grate by steam injectors. Such grates are dependent on manual labour for removing the ashes, but in this producer this has been reduced to small proportions. This same type of producer is largely used in general furnace work.

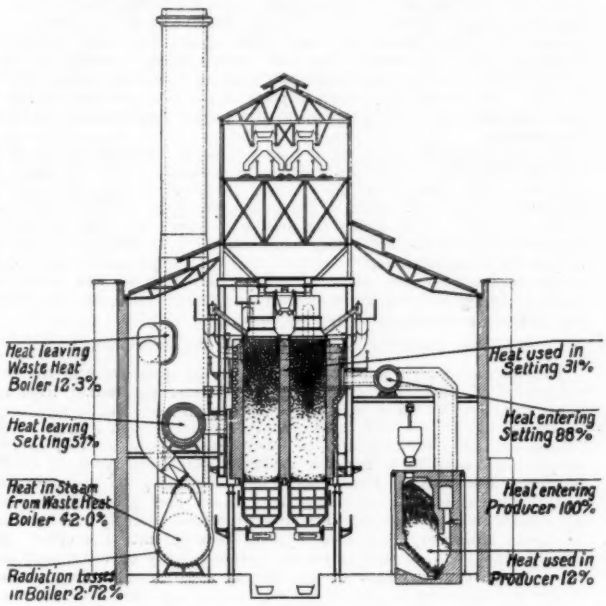

Heat leaving Waste Heat Boiler 12·3%
Heat leaving Setting 51%
Heat in Steam from Waste Heat Boiler 42·0%
Radiation losses in Boiler 2·72%
Heat used in Setting 31%
Heat entering Setting 88%
Heat entering Producer 100%
Heat used in Producer 12%

Fig. 11.—Step-Grate Producer Incorporated in a Woodall-Duckham Vertical Plant.

CONCLUSION.

I think I have shown you enough to prove that coke is one of the chief economic factors in our national life. The multitude of its applications and uses, its advantages over the use of coal, its controllability, its cleanliness, and its availability, all commend it as a fuel worthy of still further development and improvement. It is fortunate that it is a product of a thoroughly progressive industry employing technicians fully alive to all the possibilities; and I have no doubt that in the very near future, just as we have a number of gas and coke companies, all gas undertakings will so recognize the national importance of the solid fuel they produce that eventually we shall not have just a gas industry, but a gas and coke industry—or even a fuel industry. Then coke will have truly come into its own, and it will have the attention of research chemists, engineers, and commercial men which it deserves.

Discussion.

The CHAIRMAN said they were much indebted to Dr. Smith for his lucid, comprehensive, and interesting survey of the subject. He did not personally feel competent at the moment to make a contribution of any value to the discussion. He had had little to do domestic-

ally with coke; but there were one or two things which had become very much impressed upon him since he had lived in a flat.

Refuse Destruction.

One of these things was the importance of the open fire as a destructor. He thought this was an aspect which was apt to be very much under-estimated. He rejoiced in the possession of gas fires; but at the same time he did not know where he would be if he gave up his last open fire, which was the only destructor that he had in his flat. He had no idea how much there was to destroy, until he was placed in his present position. Another matter was the bulk of coke as compared with coal, which was a consideration when one was subject to the limitations of a flat. He had been awaiting, however, as many others had, a simple transformation of the domestic grate which would enable coke to be easily lighted and properly burned, without the accompaniments for which coke had to some extent gained a bad character. One of these, of course, was the dust which was liable to fly about. Coke, he thought, had been very unfairly despised as a domestic fuel. One of the elements in its bad reputation which had been quite undeserved was that it gave off products of combustion of a particularly harmful kind, whereas coal was free from this drawback. It was surprising to find how many people thought coke was particularly sulphurous. This arose from the fact that coke gave off invisible products of combustion, and people unthinkingly put their heads into them; whereas in the case of a coal fire, the products of combustion from which were visible, they would never do such a thing. He believed that an element of radiant heat would long be regarded as indispensable in British homes; but coal must not be employed for the purpose, and one was delighted to think that the public conscience had become more sensitive to this vital subject of recent years. He hoped that those concerned with fuel and fuel technology would not relax their efforts to bring to the public service heating appliances and heating materials which could be easily and satisfactorily used in place of the raw coal which in the past had done so much damage to the health and property of the community.

Dr. C. H. Lander (Director of Fuel Research) remarked that it was almost impossible to discuss the paper, because it was all facts—and very interesting facts they were. Needless to say, this great question of the utilization of coke was wrapped up with various national questions, of which the smoke nuisance was not the least important. Unfortunately, they were not all in a position to build houses for themselves and to choose their own appliances; and there were, and must continue to be for many years to come, vast numbers of grates in use which were never designed to burn coke, and to which the author's principles were not applied.

Application of Coke to Existing Appliances.

Therefore one very important aspect of the question was the development of coke. He was not going to refer to another kind of coke, the name of which was frequently on his lips; but it was very necessary to continue the development of coke in such a way as to render its use more universal in existing appliances, as well as for people who were in a position to instal the latest types of coke-burning apparatus. There was, he thought, good reason for congratulation in the assurance Dr. Smith had given them that such work was going on. The investigations recently carried out at Leeds University, and also by Dr. Lessing, into the effects of small amounts of impurities on the combustibility of coke, had led to striking results, which would have an important bearing in the future on rendering it possible to use coke in appliances which were not originally designed for this purpose. The author had referred to grading in size, dryness, &c. The "man in the street" was rather apt to look upon coke merely as coke. Unfortunately, it was not always all coke; sometimes there were also with it other things which had in the past greatly militated against its use. He might refer, perhaps, to some work recently published, the results of which showed that, through the mere increasing of the throughput of vertical retorts, a more reactive coke was made—a coke which might be ignited quite easily by a few wood chips and a sheet of paper. The Chairman had alluded to the open fire as a destructor. It might also be spoken of as a "destructor" of another kind. Atmospheric pollution could really be divided into three parts. One was the deposit of oily materials; another was the fouling of the atmosphere and the ultimate deposit of sulphur, &c.; and the third was dust. The question was not completely solved even by the use of a smokeless solid fuel. It would be very interesting if one could take a peep thirty years into the future, and see what was going to happen; but there would be little use in indulging in prophecies.

Coke must be Graded.

Mr. E. W. L. Nicol said he had been impressed with one feature of the paper, and that was the extent to which the domestic appliances shown, as well as some of those in the high power stations and the coasting steamers, called for graded coke—namely, coke which had been sized as required, and sometimes washed. This showed the importance of making provision at the works to deal with this great potential demand for graded coke. He thought the author had referred to only one piece of apparatus for which ungraded coke was preferred. This, it seemed to him, was a lesson they should all take very much to heart, so that there might be no failure to make the necessary provision. The experience quoted of firebars on coasting steamers being destroyed by using coke instead of coal was contrary to that of steam users in general; and it would be unfortunate if this suggestion were to be levelled against the use of coke. He would like the author to tell them why it was the impression seemed to have got abroad that the sulphur content of coke was higher than that of coal. Another question on which he would like to say a word was that of moisture. It was very important that coke should be supplied as dry as possible; but at the same time it had been found desirable to wash certain kinds, and for particular purposes people were prepared to pay the cost of the washing, notwithstanding the fact that the resultant coke necessarily contained rather more than the customary amount of water.

Dr. Margaret Fishenden thought the paper of great interest, because there seemed to be little doubt that the most hopeful way of ameliorating the smoke nuisance was by the extended employment of coke. In spite of the fact that the use of gas and electricity was growing greatly, the enormous amount of coal consumed for domestic purposes did not show any signs of diminishing. She did not think there were many purposes, for which coal could be used, which the right sort of coke could not fulfil better and more cheaply. With the help of coke, practically every house could be smokeless. It must, however, be always borne in mind that there were an enormous number of kitcheners at present installed which were not suitable for using coke. Most types of modern open grates, at any rate, would burn coke quite satisfactorily. Very little was known about the conditions that obtained in open fires. One ought to be able to design grates which not only had more means of control, but were also more efficient.

Potential Heat Suppliers of the Nation.

Major Richardson said the Chairman had made reference to the "bad character" of coke. It seemed to him (the speaker) that the blame for this rested with the gas people themselves. In the past it had been their custom just to produce coke, which was dealt with on the "take or leave it" principle. Now, however, they were beginning to realize that they were the potential heat suppliers of the nation, and to take steps to see that the coke was suitable. One town in the Midlands which was, he believed, paying more attention to the proper grading, &c., of coke than was the general custom, were actually sending their coke to other big towns, and obtaining 15s. per ton more for it, because people realized that this coke was worth the extra money. In attempting to make apparatus to consume coke for heating, it was essential that they should depend on radiation rather than on convection; and for this, perfect combustion must be obtained. Most important of all was to keep the radiant surface vertical. With a vertical, or nearly vertical, fire, the radiant heat was carried across the room and utilized at a suitable level. The question of the destruction of household refuse was a highly important one. Many millions of pounds a year could be saved in this country, if municipal authorities would decline to remove any destructible rubbish. For the purpose of destroying rubbish, one must make it possible for the stove or fire to carry away the products of combustion, *plus* the odours arising from this destruction. This meant a red fire to start with. There was no doubt that, for ordinary intermittent purposes, a gas fire or some other fire of that sort was extremely useful; but people still experienced the desire for an open fire, and in seeking to satisfy this desire there were over 40 million tons of coal used in a year. There was no doubt that, if gas-works and other coke makers applied themselves to the full in meeting the demand that was beginning to exist, more would be done than in any other way to rid the country of smoke.

Sulphur Deposits.

Dr. J. S. Owens (Hon. Secretary of the Advisory Committee on Atmospheric Pollution) pointed out a curious fact in connection with sulphur. With stations which had a very low total deposit of impurity, the percentage of sulphur deposit was always higher than in the case of stations which had a bigger total deposit of impurity. The actual quantity, of course, was lower, but the proportion was higher. This was a curious thing; but there was another fact which had to be taken in association with it. He had recently been examining the figures for London and Glasgow. Since 1914 there had been a fairly steady reduction in the quantity of impurity in the air of both cities. In London, not only had the total impurity gone down, but the percentage of sulphur had gone down also. When comparing one station with another, the percentage of sulphur did not go down as the total impurity fell; whereas when a city began to improve as London had, the sulphur went down more rapidly. He did not pretend to explain this; but it was interesting to note that the efforts which had been made to reduce smoke had actually lowered the sulphur percentage, whatever the cause of that might be. It was important to remember this, because, as had already been remarked, it was usually advanced against the smokeless fuel theory that one would not do away with the sulphur, if one did away with the smoke. The introduction of coke as a domestic fuel had led, of course, to experimenting in ordinary fires, and to failure in a good many of them. For a good many years people had been trying to adapt the fuel to the appliances which they had; and they seemed to have ceased to consider the possibility of adapting the appliances to the fuel. Whichever method might be right, there was no doubt there were these alternative ways of dealing with the situation. It seemed to him that to say a fire was put into a house to heat it was not telling the whole story; it was put in also to increase the comfort of a house. Sitting in front of a black stove did not give the comfortable feeling of sitting in front of a bright radiant fire. There was a great deal said about the efficiency of fires; and this was a point that was not at all clearly understood. One could not state what the efficiency of an apparatus was, unless one knew what its function was. They did not know what the function of a fire was, so they could not tell the efficiency. To his mind, the best measure was the heat loss at the top of the chimney; and with this standard, he had succeeded in getting nearly 100 p.ct. efficiency. Turning to another aspect of the subject they were discussing, he thought a good deal turned on the fact of products of combustion being invisible. For a long time gas suffered from prejudice on account of the escape of fumes into rooms. They so escaped because one could not see them. Had they been smoky coal fumes, they would have been seen, and so would not have been allowed to escape. The same thing applied to coke as to gas. It was good to note the public recognition of the need for purifying the air. It was indefensible that they should pour forth into the chimneys the sewage from their fires, in the same way that they used to pour other sewage into the rivers. For many years he had felt that the way to solve the problem was to awaken the public conscience, and that then the methods of improvement would follow—as, indeed, they

were following. In many towns now there was a steady reduction of impurity; and he thought this would go on.

A SUGGESTION FROM DENMARK.

Mr. S. G. FIEDLER said that in Denmark, where people had not been used to open fires, they naturally did not miss them as they would be missed in England. There was no doubt, however, that such fires could be made to burn coke; and illustrations had been thrown on the screen which had interested him very much. To his mind, the great drawback was that most of them went out during the night, and had to be re-kindled in the morning. The most desirable thing was to construct a fire that would burn as an open fire when wished, and could be closed in some mechanical way so that it might be turned into a slow combustion stove during the night. This would maintain the temperature in the room through the night; and in the morning a few minutes only would be required to provide a bright fire.

[The time for the closing of the meeting had by now arrived; and there was thus but little opportunity for the author to reply to the various points that had been raised in the discussion.]

Dr. SMITH said that there was definitely less sulphur in coke than in the coal from which it was produced. He congratulated Dr. Fishenden upon the remarkable work she had done in connection with the domestic grate. As regards radiation, he was beginning to doubt very much the efficacy and usefulness of high-temperature radiation for heating purposes. Personally, he did not agree that it was comfortable to sit immediately in front of a really first-class gas fire.

BOARD OF TRADE GAS UNDERTAKINGS RETURN FOR 1925.

Part II.—Finance and Prices.

The second part of the Return for the year 1925 relating to all Authorized Gas Undertakings in Great Britain was issued recently by H.M. Stationery Office (Adastral House, Kingsway, London, W.C. 2, and Branches), at the price of 10s. 6d. net, postage extra. This furnishes the usual statistics bearing upon finance and prices; while Part I. (which was reviewed in the "JOURNAL" for Oct. 6 last, p. 37) dealt with manufacture and supply.

There are 782 companies and local authorities included in the part of the return just published. This is one more than the number dealt with in Part I.; the new undertaking being that which the Cove and Kilcreggan Corporation have acquired under the Burghs Gas Supply (Scotland) Acts. On this occasion the Companies, at 465, are two less than was the case a year ago; but the local authorities, at 317, number two more than in the 1924 return.

The particulars as to prices charged are, unless otherwise indicated, for Dec. 31, 1925, for English and Welsh undertakings, and May 15, 1925, for Scottish ones. The other information given in the return relates (except where otherwise noted) to the calendar year 1925 in the case of companies' undertakings, and, for local authorities, to the year ended March 31, 1926, for concerns in England and Wales, and the year ended May 15, 1925, for those in Scotland.

The total nominal capital invested in the undertakings dealt with in the return is £171,987,989, including loans borrowed by local authorities and since repaid. This is an increase of £3,582,215 over the amount shown in the previous return. The receipts of the undertakings on revenue account, which amounted to £66,042,643, show a decline of £667,347 from the previous year's total; but the expenditure, at £56,908,648, is less by £978,979, and the gross profit has been increased by £311,632.

Comparative tables in the return, which are reproduced below, set out separately the financial results for the companies' undertakings and those belonging to local authorities for the whole of Great Britain; in the former case for the years 1920 to 1925, and in the latter for the financial years 1920-21 to 1925-26.

In connection with the companies, the figures in the body of the return for 1925 are further split-up as follows:

England and Wales.—Total capital authorized, £100,561,256; capital and premiums paid-up, £86,298,338; loan capital authorized, £33,022,547; loan capital issued, £22,708,592; revenue account receipts, £43,790,276; expenditure, £37,986,153; profit, £5,804,884 (loss, £761).

Scotland.—Total capital authorized, £310,656; capital paid-up, £259,058; loan capital authorized, £123,491; loan capital issued, £69,625; revenue account receipts, £141,443; expenditure, £112,332; profit, £29,111.

The corresponding figures in the return for the local authorities for 1925-26 are divided-up thus:

England and Wales.—Total amount of loans authorized, £53,299,361; money borrowed, £48,603,324; loans repaid and balance left in sinking fund, £26,788,797; revenue receipts, £17,402,079; expenditure, £14,626,588; gross profit, £2,775,491; interest paid on loans, loans repaid, and amounts placed to sinking funds during the year, £2,353,697; net profit, £421,794.

Scotland.—Total amount of loans authorized, £16,093,276; money borrowed, £14,049,052; loans repaid and balance in sinking fund, £6,637,533; revenue account receipts, £4,708,845; expenditure, £4,183,575; gross profit, £525,270; interest paid on loans, amount of loans repaid, and amounts placed to sinking fund during the year, £700,212; net loss, £174,942.

In addition to the columns shown in the tables reproduced, the return gives information as to the Special Acts of Parliament and Orders relating to each undertaking, as well as the maximum or standard price of gas per therm, or per 1000 c.ft., as the case may be, and the actual prices charged to prepayment consumers, to ordinary consumers, for power, &c., and for public lamps. There is also a column showing the scale of annual charges for meter rent to private consumers.

COMPARATIVE TABLES.

Companies' Undertakings.

Year.	Number of Authorized Undertakings included in Return.	Total Capital (Share and Stock).		Total Loan Capital, including Debenture Stock.		Revenue Account.		
		Authorized.	Paid-up.	Authorized.	Issued.	Receipts.	Expenditure.	Profit.
		£	£	£	£	£	£	£
1920 . . .	494	98,469,716	82,065,243	29,109,279	18,418,665	53,714,841	49,566,608	4,148,233
1921 . . .	488	99,422,967	83,063,256	32,357,024	21,104,283	51,870,058	47,588,176	4,281,882
1922 . . .	481	100,437,430	83,793,973	33,751,958	22,011,223	46,541,952	39,785,069	6,756,883
1923 . . .	475	100,374,599	84,561,849	33,957,362	22,035,911	44,226,797	37,839,199	6,387,598
1924 . . .	467	100,553,738	85,537,819	34,581,299	22,544,907	44,293,709	38,756,098	5,537,611
1925 . . .	465	100,871,912	86,557,396	33,146,038	22,778,217	43,931,719	38,098,485	5,833,234

Local Authorities' Undertakings.

Year.	Number of Authorized Undertakings included in Return.	Total Amount of Loans Authorized.	Total Amount of Money Borrowed.	Total Amount of Loans Repaid, and Balance in Sinking Fund.	Revenue Account.			Interest paid on Loans, Amount of Loans Repaid, and Amount placed to Sinking Fund during Year.	Net Profit or *Deficit.*
					Receipts.	Expenditure.	Gross Profit.		
		£	£	£	£	£	£	£	£
1920-21 .	304	52,823,504	48,916,008	25,076,806	27,244,570	24,535,685	2,708,885	2,269,573	439,312 profit
1921-22 .	309	60,767,887	53,770,157	26,725,430	26,569,144	25,061,731	1,507,413	2,610,228	*1,102,815 deficit*
1922-23 .	316	64,519,579	57,123,829	28,616,471	24,084,699	19,414,366	4,670,333	2,901,500	1,768,833 profit
1923-24 .	310	65,533,169	58,612,494	30,027,099	23,349,561	18,754,701	4,594,860	2,965,295	1,629,565 profit
1924-25 .	315	67,625,057	60,323,048	31,746,240	22,416,281	19,131,529	3,284,752	3,026,677	258,075 profit
1925-26 .	317	69,392,637	62,652,376	33,426,330	22,110,924	18,810,163	3,300,761	3,053,909	246,852 profit

NOTES ON NEW BOOKS.

A TEXTBOOK OF AMERICAN GAS PRACTICE*.

Reviewed by Dr. W. B. DAVIDSON.

This volume, the first edition, corrected, was published in pamphlet form from October, 1925, to November, 1926, and reprinted in November, 1926. As will be observed, the author is also the publisher. There are several things that strike one on opening the book and scanning its pages. One is the printing, which is of small type-written style—five-point, in fact. It is evident that the printers, the National Process Company, of New York, adopted the method of typewriting and photography. Though to many this style may appear at first sight attractive, it does not bear close inspection, for one finds the usual faults of typewriting—incorrect alignment and displacement of type here and there, unevenness of striking, with consequent variation in the depth of the impression, and blurred letters, especially a's and w's. Confinement to two sizes of type, small letters and capitals, is also a great disadvantage as compared with ordinary printers' type, many kinds of which can be requisitioned for purposes of clarity of text. The reviewer likes the size of the pages, 10⅛ in. by 8¼ in., which is very suitable for large diagrams and drawings. Many of the figures, of which there are 241 in the volume, are excellent. Those in half-tone are especially admirable. In a good many cases, however, one can make out the description of the drawing only with the aid of a good lens. The diagrams of graphic molecular formulæ of chemical compounds seem, on the other hand, altogether too large and coarse, wasting valuable space. It is curious to observe, as in fig. 14, p. 43, how a word has been corrected, typewriter fashion, by striking out the wrong word and inserting the correct one above.

These peculiarities are of secondary importance, though they are the first to catch the eye. With the subject-matter one can find little fault; and the great bulk of the book is admirably put together, forming most interesting reading, which can be heartily recommended to British gas engineers, though the plant and practice described are applicable in many cases only to the American method of gas manufacture.

In the first chapter the author quotes a recent cheery dictum of one of the leading gas men in America: "It is the consensus of opinion of those who have given serious thought to it, that the time will come, and very probably in our generation, when gas will be practically the universal fuel; the reason for this is one of economics and conservation of natural resources."

One is glad to see several chapters devoted to the chemical and physico-chemical fundamentals underlying the study of gas manufacture, which are too scantily treated in most textbooks on gas manufacture. Thus Chapter II. deals with "The Physical Characteristics of Gases;" Chapter III. with "Fuel Gases and their Composition;" Chapter IV. with "The Components of Fuel Gases;" Chapter V. with "The Heating of Gas-Making Apparatus." The last is a long chapter giving a lucid account of the nature of combustion, luminosity, thermo-chemical reactions, &c., and treats of firing with gaseous and solid fuel by direct, recuperative, and regenerative methods. Useful typical examples are given with illustrations. The nitrogen content of typical coal gases quoted is remarkably low: Verticals, 2·8 p.ct.; horizontals, 3·2 p.ct.; coke ovens, 3·4 p.ct. We are apparently not so much afraid of inerts in this country as they are in America.

"Coals and their Relation to Coal Gas" forms the subject of Chapter VI. Then follows "The Carbonization of Coal," treated all too briefly. The author quotes Meade as stating that a "good quality gas coal" should yield 65 to 70 therms per ton. The reviewer thinks these figures apply rather to second-class coals. "General Outline of a Coal Gas Plant;" "Gas-Works Refractories;" "Carbonizing Apparatus—(1) Retort or Small-Charge Systems; (2) Coke Ovens or Large-Charge Systems;" "Conveying, Crushing and Screening" are fully dealt with in successive chapters; and the plant is splendidly illustrated. Chapter XIII. consists of thirty pages on "Boiler Plants in Gas-Works," and is remarkable for its wealth of detail—rather unnecessary it seems to the reviewer, seeing that most of our gas-works are provided either with very cheap coke breeze or dust, making fuel economy less urgent than in extraneous steam-raising stations, or have available from the retort house a large surplus of waste heat which can be utilized in simple waste-heat boilers for producing all the steam required, except where much water gas is made.

A large proportion of the book, 120 pages, is devoted to "Blue Gas" and "Carburetted Blue Gas or Water Gas." This was to be expected, seeing how largely carburetted water gas bulks in the town gas of the United States. It is interesting to see the figures for gas production in that country and to note the annual increase and the proportion of carburetted water gas. The figures are:

	1921.	1922.	1923.	1924.
Total, billions of c.ft. . . .	333	353	380	388
P.ct. carburetted water gas .	61·9	62·9	60 5	61·1

The whole subject of water gas, blue and carburetted, is discussed and explained in a masterly way, which is bound to be appreciated by English readers.

Of great interest are the two following chapters on "Pacific Coast Oil Gas" and "Dayton and Thwing Oil Gas Processes." About 27 billion c.ft. of oil gas are annually distributed in the United States. The Pacific Coast oil gas process is based on the gasification of oil with steam on hot checker-brick, and gives a gas high in hydrogen and comparatively low in unsaturated hydrocarbons, having a calorific value of about 530 B.Th.U. The opinion is expressed that, in spite of improvements in manufacture, coal gas will displace oil gas for the base load even on the Pacific Coast, though its use for peak loads will long continue.

The Dayton oil gas process is briefly described as a new method of gas-making patented by Walter C. Dayton in 1924. Oil is atomized with a regulated amount of preheated air in a retort at 1350° to 1750° Fahr.; the combustion of part of the oil with the oxygen of the air providing the temperature necessary to crack the rest of the oil to permanent gases. The percentage composition of the gas is roundly as follows: CO_2, 6; unsaturated hydrocarbons, 14; oxygen, 1; CO, 6; CH_4, 8; H, 2; N, 63; calorific value, 500 B.Th.U. So far there is only one public utility supplying this gas. The Thwing process is a recent development. That there is no special inducement to instal this process in this country is shown by the fact, as stated, that it takes 4 gallons of oil to produce 1000 c.ft. of 450 B.Th.U. gas; 0·3 gallon of tar being recoverable.

There follows an excellent chapter on "Condensing, Exhausting, and Scrubbing." The theory of heat transfer by radiation, conduction, and convection is explained in a way that a non-mathematical mind can readily understand. Exhausters are not described in all the refinements one expects in a treatise of this kind.

Prominence is given to the de-tarring of gas by electrostatic precipitation at very high voltages; and designs of Cottrell electrical precipitators for the cleaning of cooled gases are shown, together with the results obtained therefrom. Designs of various forms of condensers, washers, and scrubbers are set forth, no doubt in an exhaustive manner so far as American practice is concerned, but one misses the British names. A Feld centrifugal washer of 16 ft. diameter, capable of dealing with at least 20 million c.ft. of gas per day, is described. "Distillation of Ammonia Liquor" is treated at moderate length; very little information being given regarding the manufacture of neutral sulphate of ammonia.

"Removal of Sulphur by Oxide and Liquid Purification" is the title of the next section, which is not discussed so fully as one would like or expect. The Seaboard process of liquid purification by means of a solution of sodium carbonate, as designed and worked by the Koppers Company, is described at considerable length. Very scanty information is supplied regarding methods, successful or otherwise, of removing organic sulphur.

"Low Temperature Carbonization" forms the subject of a concisely written chapter in which the principal methods, British and American, are briefly given. Results of tests by the Fuel Research Board are quoted. Regarding the nature of the tar oils and motor spirit obtainable, one finds very little account. In fact, the book is obviously lacking in that it supplies extremely little information about tar products.

One turns with special interest to the section on "Complete Gasification." This includes modified Mond producers, with a superimposed distilling chamber, di-gas plant (Tully gas), and tri-gas plant (Dellwick-Fleischer, Jefferies-Norton, Doherty). There is no proper discussion, however, of the pros and cons of complete gasification as a means of providing cheap town gas.

The treatise concludes with a four-page chapter on "Elements of Gas Plant Design," followed by an important section (18 pages) on "Developments and Future Problems." Prominence is given to quotations from last year's paper of George Wehrle, in which he gave an account of his successful experience in the supply, for the last three years, of 400 B.Th.U. gas in the large town of Denver, Colorado. The rule of the Colorado Public Utility Commission is quoted as "one of the most, if not the most, desirable in the country." It runs: "This standard heating value shall be that value which from its experience the Utility finds it most practical, economical, and efficient to manufacture and to supply to its customers

* "Manufactured Gas," by Jerome J. Morgan, M.S., Ph.D., Associate Professor of Chemical Engineering, Columbia University. In two volumes. Vol. I., Production, pp. 518; published by Jerome J. Morgan, Broadway, at 119th Street, New York, 1926.

to their satisfaction. The Utility shall be prepared to justify the standard it adopts before the Commission by such pertinent facts as may be required."

The book was primarily undertaken, the author states, to supply the needs of a large body of gas engineering students who wished to become familiar with American practice in gas manufacture. Prof. Morgan has completed his task in a most meritorious and handsome manner; and the reviewer looks forward with interest to the publication of Volume II. on the subject of gas supply.

LEAD FOR CHEMICAL PLANT.

A Criticism of the "B.E.S.A."

At a Conference of the Institution of Chemical Engineers on March 9—Sir ALEXANDER GIBB, the Vice-President, in the chair—Mr. S. J. TUNGAY read a paper on "Lead as a Constructional Material for Chemical Plant." In this the author mentioned the work of Mr. C. E. Barrs on the influence of impurities in lead and its behaviour when heated with concentrated sulphuric acid. This work was specially undertaken in order that it might prove helpful to users of lead for chemical purposes, and in particular to manufacturers of sulphuric acid. According to this authority, two different brands of lead furnished as acid resisting lead showed very different resisting power when subjected to the action of concentrated sulphuric acid.

Two samples, marked A and B, respectively, were tested, and gave the following analysis:

—	A, P.Ct	B, P Ct.
Copper	0·002	0·021
Bismuth	Trace	0·005
Silver	0·001	0·002
Arsenic	0·001	Trace
Antimony	0·009	0·003
Iron	0·005	0·004
Manganese	Trace	0·001
Zinc	0·001	0·001
Lead (by difference)	99·981	99·963

The lead A was rapidly attacked by the acid at 250° C., while B resisted the attack until a temperature equal to 296° C. was attained. This, said Mr. Tungay, tends to show that the lead having the higher percentage of impurity in the form of copper withstood sulphuric acid the better.

The same authority, continued the author, made a further series of tests on chemical lead from different sources, which again showed a greater resistance with copper as the predominating impurity when subjected to a test with hot sulphuric acid.

Two further typical examples, C and D, are stated below:—

—	C, P.Ct.	D, P.Ct.
Copper	0·017	0·017
Bismuth	0·004	0·001
Silver	0·002	0·002
Arsenic	Trace	0·001
Antimony	Trace	0·301
Iron	0·003	0·003
Manganese	0·001	0·001
Zinc	0·001	Trace
Lead (by difference)	99·972	99 674
Attacked by sulphuric acid (*i.e.*, action vigorous) at	300° C.	260° C.

Increased purity of the lead rendered it more resistant to attack by acid. The only slight impurity which might be preferred would be a small percentage of copper.

CRACKER PIPES.

Mr. Tungay had experience four years ago of some lead cracker pipes in a large sulphate of ammonia saturator. These were ½-in. thick when made, and rapidly corroded away until after about seven months working the lead fractured, and was found in places to be only of the thickness of paper. It was difficult to ascertain the cause of such continuous and rapid corrosion. When replaced by new pipes, a similar failure was reported. The lead was analyzed in both instances—it was purchased as "chemical lead" from manufacturers of high repute—and was found after failure to show a lead content of 99·99 p.ct., and to be practically free from zinc. Ultimately it was determined that mechanical strains and continued sagging of the metal were undoubted causes of failure; for when the pipes were finally supported in such a manner as to prevent any possibility of creeping or deformation during operation of the plant, no unreasonable amount of corrosion was experienced.

MR. PARRISH CRITICIZES THE "B.E.S.A."

In the course of the discussion, Mr. PARRISH, of the South Metropolitan Gas Company, said that eight or nine months ago he had occasion to make a serious declaration with regard to what was proposed by the British Engineeering Standards Association concerning the specification proposed in connection with chemical sheet lead. From those observations he had nothing to retract; indeed, he confirmed what he had said on the previous occasion. It was perfectly clear from the draft specification that had been circulated by the "B.E.S.A." that they did make the quality of chemical sheet lead dependent on the content of copper; and he considered this to be an unwise and inexpedient thing to do. Mr. Tungay's reference to lead cracker pipes in a large sulphate of ammonia saturator had made confusion worse confounded. It must be remembered in connection with chemical sheet lead that occasionally there arose the question of the effect of alkalis. Basic plumbates had to be considered when dealing with sodium carbonate at 60° or 70° C. With ammonia and steam passing through the cracker pipe, there would be alkaline conditions inside and acid conditions outside. The separation of ammoniacal liquor brought with it a certain amount of tarry matter; and in the distillation of the ammoniacal liquor a number of the constituents of the tar were volatile. Cresols were brought forward into the saturator, particularly in the case of works which did not treat their tar or liquor in a scientific way; and cresols definitely attacked chemical sheet lead.

AS OTHERS SEE US.

To see ourselves as others see us is generally interesting, and often instructive. The following are a few extracts in this connection from a report published in "Das Gas- und Wasserfach" for March 5 last.

A meeting was organized by the German Gas Association, and held in Munich on Feb. 22, chiefly to hear an account of a recent visit made by Herr Ludwig, Chairman of the local gas undertaking, to America. Though it is not specifically stated, he must also have seen something of the English gas industry. In the course of his remarks, he said that the English gas-works are in good condition, but on some works there is a curious mixture of that which is oldest with what is most up-to-date, a state of affairs which is rarely met with in Germany. Continuous verticals are much in evidence, since the English works are mostly situated in densely populated districts of the towns, and so have to pay great attention to smoke and soot abatement.

Gas supply in England is subject to very strict legislative regulations, which deal with price on a calorific standard, as well as pressure and chemical composition. Strict official supervision is exercised. It is interesting to note that London alone consumes 27 p.ct. of the total English make, or an amount almost equal to the total consumption of Germany.

English gas apparatus are, generally speaking, of extraordinarily heavy construction, and mostly of cast iron. They would not satisfy German requirements either from the practical or the æsthetic point of view. They fit in, however, with the customs of the country's life, especially as regards the depth of the oven, which is used so much to roast the traditional leg-of-mutton, and for the baking of bread. The English apparatus have one great advantage over the German, which is of considerable assistance alike to manufacturer and consumer, in that standardization is much more advanced. This is still more the case in America, where parts are to a very large extent interchangeable. In neither country is the so-called "economy flame" found in cookers, which has made such strides in Germany; there being only one tap for the regulation of each burner. In America, new types of apparatus which are intended for the general public are subjected to most exhaustive tests, often lasting as long as a year. When the right type has been selected, it is officially stamped; the stamp being valid for one year only. This provides a safeguard against unauthorized variations from approved patterns.

Propaganda in England is not carried on to the same extent as in America, where it is developed to a remarkable extent, as regards both the training of personnel and the characteristic use of the Press.

MIDLAND JUNIOR GAS ASSOCIATION.

[Not long ago—see "JOURNAL" for Dec. 22, 1926, p. 765—Mr. C. M. Croft, Chief Engineer of the Wandsworth Gas Company, showed what excellent results were obtained by centralized control of retort houses. The "Arca" regulator is employed for this purpose at the Wandsworth Works; and this instrument, and its method of installation at the Windsor Street Gas-Works, Birmingham, were described by Mr. A. St. Dunstan Corder in a paper at this meeting of the Midland Juniors. It was the general view of the meeting that the old-type retort house governor is too slow in action, whereas the "Arca" is practically speaking instantaneous. With its use, the interval between scurfing is lengthened.]

A Meeting of the Association was held in Birmingham on Thursday, March 17, when the following paper was read.

VACUUM CONTROL IN THE RETORT HOUSE BY AUTOMATIC REGULATORS.

By A. ST. DUNSTAN CORDER, of the Birmingham Corporation Gas Department.

In bringing this subject before you, I wish it to be quite understood that I make no pretext of presenting you with a technical treatise, but merely endeavour to describe to you our experience at Windsor Street with what one might term multiple, or sectional, vacuum control in the retort house. Before proceeding with the subject-matter of my paper, I cannot help alluding to the most interesting paper lately read before the London and Southern District Junior Gas Association by Mr. C. M. Croft, Chief Engineer of the Wandsworth Gas Company. Although my paper deals with a somewhat different application of the "British Arca" regulator, some of the matter will necessarily cover similar ground.

PLANT AT WINDSOR STREET.

I propose to commence by giving you a short résumé of the carbonizing and exhausting plant at Windsor Street, inasmuch as this plant has a somewhat material bearing on the subject under discussion. The carbonizing plant consists of six ranges of Woodall-Duckham vertical retorts, all situated in one retort house. Five of these are composed of retorts having a nominal throughput of 5 tons of coal per diem, and the sixth of retorts with a nominal throughput of 7 tons. The ranges of smaller retorts are in beds of four, with a central producer to each bed. Each range comprises eleven beds, sub-divided into half-ranges of six and five beds respectively. The range of 7-ton retorts is composed of 32 retorts, which may be considered as single units, as the heating of these is carried out by two batteries of producers, one situated at either end of the setting, which can thus be worked in two halves. The total number of retorts is therefore 252, which with steaming give a maximum hourly make of gas somewhere in the neighbourhood of 900,000 c.ft.

As most of you are doubtless familiar with Woodall-Duckham verticals, there is no need to go into details of the gas off-take arrangements. Briefly, on some ranges there are off-take pipes from two retorts, leading to the usual "seal pot," with a valve of the turntable type embodied in each off-take pipe; while on others there is a seal pot to each retort. From the seal pot, a short ascension pipe leads to the foul main above; each pipe being fitted with a wheel valve. There are two foul mains to each range of retorts—*i.e.*, one over each row of seal pots. These feed into three large collecting mains, one of which passes down the centre of the retort house, across the ranges, while the other two run one at either side of the house, along the ends of the retort benches. The side mains have each a central connection, in the manner of a duplicate main, to facilitate the removal of the gas, and are further inter-connected by two cross mains. This central connection is provided in order to equalize the exhauster pull.

The gas is conveyed from the retort house by three 30-in. mains to the atmospheric and water tube condensers, and by a suitable arrangement of valves and by-passes can be distributed through the condensing plant from any of the three mains, as required. On leaving the condensers, the gas is split-up into two streams, and is treated by Livesey washers and "P. & A." tar extractors; the two 36-in. mains which convey it becoming common at the inlet to the exhausters, by a loop arrangement.

The exhausting plant consists of three high-speed turbo exhausters, by the British Thomson-Houston Company. Each of these machines is fitted with a Waller hydraulic governor, operating on to the balanced throttle valve. Two of them are capable of dealing with 750,000 c.ft. of gas per hour each, and the third is rated at 500,000 c.ft. per hour. All work at a maximum speed ranging between 3400 and 3900 R.P.M., and are capable of maintaining a vacuum of 18 in. water column and a pressure of 40 in.

The governors are capable of control within $\frac{1}{10}$ in. water column on the vacuum side, with a load varying 10 p.ct. in volume and 15 p.ct. in pressure. When all the ranges in the retort house are at work, two of the exhausters are in use; the small one being run at a fixed speed and the large one running under control of the governor. The vacuum service required for the Waller governor bells is a 2-in. pipe, taken from the central foul main at a point between the two middle ranges. Two branch pipes of the same diameter are also run from this point, one to each of the other large collecting mains. There is also an alternative 2-in. vacuum service taken from a special junction box at the inlet to the condensing plant. Thus it can be used with any variation in the flow of gas through the condensers.

WHY AUTOMATIC VACUUM CONTROL WAS ADOPTED.

I will now proceed to the next part of my paper, and mention some of the considerations which influenced the decision to adopt the system of automatic vacuum control described hereafter. It is obvious, when one considers the size of the retort house at Windsor Street, and the large number of retorts at work, that to obtain satisfactory results some method of regulating the exhauster pull at various points is desirable. In the first place, there is the considerable difference in distance of the various ranges from the main source of pull; secondly, and of more importance, the influence of converging streams of gas banking one on top of another; and lastly, but of equal importance, the fact that these streams of gas gradually vary in volume, in accordance with change of coals and alterations of steam.

At a large works such as ours, we unfortunately have to deal with a mixture of coals, which frequently runs into a dozen or so different kinds. These coals each have a varying volatile content, and behave differently with regard to the speed at which gas is evolved, and the time necessary for proper carbonization. This difference in the material being carbonized is, of course, the main cause of irregularity in the volume of gas being produced. Other causes, in many cases closely allied to the same source of trouble, come under the heading of voluntary alterations in working—in particular, changes in the extractor speeds. These are sometimes necessary to correct deviations from the required calorific value of the gas, though this may be largely overcome by alterations in the quantity of steam used. Another very important consideration which influenced the decision to introduce a system of automatic vacuum control is the fact that the range of 7-ton retorts stands some 18 in. higher than the others, thus making it more difficult to equalize the exhauster pull.

The method of controlling the vacuum was originally assisted by the lay-out of the foul main system in the retort house; an attempt being made to bring all ranges equidistant from the exhauster. The general arrangement of the mains and valves which existed prior to the introduction of the automatic regulators may be summarized as follows. There are two foul mains of approximately 20-in. diameter running above each of the ranges, which feed into three large collecting mains, one in the centre and one on either side of the retort house. The section foul mains above the first three ranges of 5-ton retorts are provided with rack and pinion valves just prior to their junction with the two outside collecting mains. They are connected to the central main, which is on a higher level, by short rising pieces, which are also provided with valves. In the case of the range of 7-ton retorts and the other two ranges of 5-ton retorts, the central collecting main is on the same level as the foul mains, which thus branch directly from it. Valves are therefore provided at each point where a section foul main joins the centre and outside collecting mains.

The governing of the Waller governor on the exhausters was not sufficiently delicate to give satisfactory results with such a large system of mains, so it was decided to introduce a system of automatically controlled valves at various points. From some of the preceding remarks one would assume that the ideal would be to have an automatic regulator to (say) each bed of retorts. However, as there is a limit to the practicability of such an idea—to say nothing of the capital outlay—it was decided to divide each range into four sections and fix an automatic regulator to each section. Thus plans were prepared for an installation of 24 automatic regulators, the type chosen being the "British Arca."

REGULATORS AND GOVERNORS.

Before describing this instrument, I will make a few comments on regulators and governors in general, and in particular on their suitability for the use under discussion. To give satisfactory results regulators must comply with the following conditions:

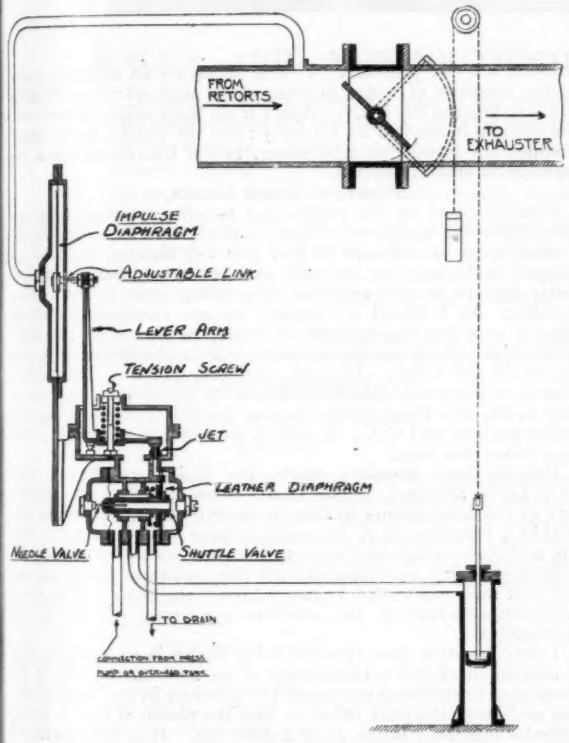
(1) They must be sensitive to small variations in the physical state of the matter to be regulated.
(2) They must be automatic, instantaneous in action, and have great accuracy.
(3) They must be capable of exerting a comparatively large force.
(4) They must be simple in construction, reliable in action, and not likely to get out of order.

In the past, the usual types of governor or regulator used for

controlling the vacuum in the foul main depended for their operation solely on the pressure of the gas. When speaking of pressure, one must remember that, in using the term broadly, it may be positive or negative. This pressure was usually magnified by means of a bell or a flexible diaphragm. Even then the governors were slow in action, and not infrequently failed to function properly, owing to the power exerted being insufficient to overcome any extra load imposed upon them by pitchy matter accumulating round the moving parts.

THE "ARCA" REGULATOR.

The "Arca" regulator, which I will now describe, consists of an operating hydraulic cylinder and a very sensitive relay control. Thus any kind of impulse, however slight, to which the relay control is submitted, is transferred through the hydraulic cylinder into a considerable force, sufficient to operate valves or other mechanisms—in this particular case, a butterfly valve in the foul main. The action is instantaneous, due to the fact that the relay is practically free from friction, and that a non-compressible liquid is the medium for transmission of force to the regulator.



Arrangement of "Arca" Vacuum Regulator.

The general action of the particular instrument in question is therefore as follows: The relay control is governed by the pressure in the foul main, but is operated by some suitable fluid at a pressure of not less than 15 lbs. per sq. in., transmitting the power required to the pressure cylinder, which in turn moves the butterfly valve in the foul main. The actual governing of the vacuum is therefore performed by this valve. However, as it is an ordinary circular metal disc, mounted on a spindle which works in a gland, it requires no further description.

The pressure cylinder consists of a vertical outer casting, approximately 3 ft. in height, which contains a brass liner, in which the plunger works. The cylinder stands on a base roughly 8 in. square. The plunger is simply a strong leather bucket $3\frac{3}{16}$ in. in diameter, suitably attached to a brass rod, which works in a gland. The rod is long enough to allow the bucket to move the whole length of the cylinder.

Attached to an eye screwed on the top of the rod is a $\frac{1}{4}$-in. diameter wire rope, which passes over a $4\frac{3}{4}$-in. diameter pulley. This is fastened to a double grooved quadrant on the spindle of the butterfly valve in such a way that the wire from the piston rod runs in one groove, and the other end of the wire, to which is attached a counterbalance weight, runs in the other. The counterbalance weight is of sufficient magnitude to overcome the friction of the bucket and weight of fluid in the cylinder, and also any reasonable resistance to the movement of the butterfly valve in the main. Its actual function will be more apparent later. From the top of the pressure cylinder a $\frac{3}{4}$-in. solid cold-drawn weldless steel pipe leads to the relay control.

The fluctuations in pressure in the foul main are transmitted by means of a service pipe to the back of a large flexible diaphragm, situated in a case above the actual relay arrangement. The movement of this diaphragm is transmitted through a small connecting link to a pivoted L-shaped lever arm; the link being connected to the vertical limb. At the end of the horizontal limb there is a small, faced disc, which impinges on a jet of the operating fluid. Thus the movement of the lever varies the pressure in a chamber, from which leads a passage supplying the jet.

This variation in pressure is magnified by a stout leather diaphragm, to which is attached a shuttle or pilot valve. This valve works in another chamber, to which are connected the inlet and outlet pipes which convey the operating fluid. These are three in number; the inlet pipe conveying the fluid at pressure, the outlet pipe carrying away the waste liquid, and, situated between them, the pipe to the pressure cylinder, which acts as either inlet or outlet to and from the cylinder. Thus, by a suitable arrangement of ports, the movement of the shuttle valve allows the main portion of the operating fluid to enter or to leave the pressure cylinder, and so to operate the butterfly valve which controls the pressure in the foul main. The essential regulating feature is, therefore, the jet of fluid, which, by being partially choked or allowed to flow freely, according to the movement of the pivoted lever, causes movement of the pilot valve and thereby of the operating piston in the hydraulic cylinder.

An important feature of the shuttle valve is a small passage through its centre, which conveys that portion of the fluid which supplies the jet and also operates the valve. The quantity of fluid is regulated by a small needle valve, situated in this passage. This needle valve also reduces the pressure of the fluid, and makes it independent of fluctuations in the pressure of the main supply. Obviously the pressure required to operate the sensitive mechanism of the relay apparatus is not nearly so great as that required for the pressure cylinder.

Another important part of the apparatus is a spiral spring, which works against a shoulder on the shuttle valve in opposition to the pressure against the leather diaphragm, and thus completes the sliding motion of the valve.

The foregoing description of the working of the regulator would not be complete without making it clear that the pressure of the fluid provides the necessary power for opening the butterfly valve; but the counterbalance weight is responsible for closing it and expelling the fluid from the hydraulic cylinder.

The last item of importance is the method of setting the instrument to give the desired pressure in the foul main. This is effected by means of an adjustable tension spring and screw which operate on the L-shaped lever arm against the action of the large impulse diaphragm, and thus regulate the jet of fluid.

FIXING AN INSTALLATION OF 24 REGULATORS.

The impulse pipes to the backs of the large flexible diaphragms are taken from positions half-way along the sections of main controlled by the various instruments. These are of ample size, being $1\frac{1}{2}$ in. in diameter, so as to give an unrestricted impulse to the diaphragms.

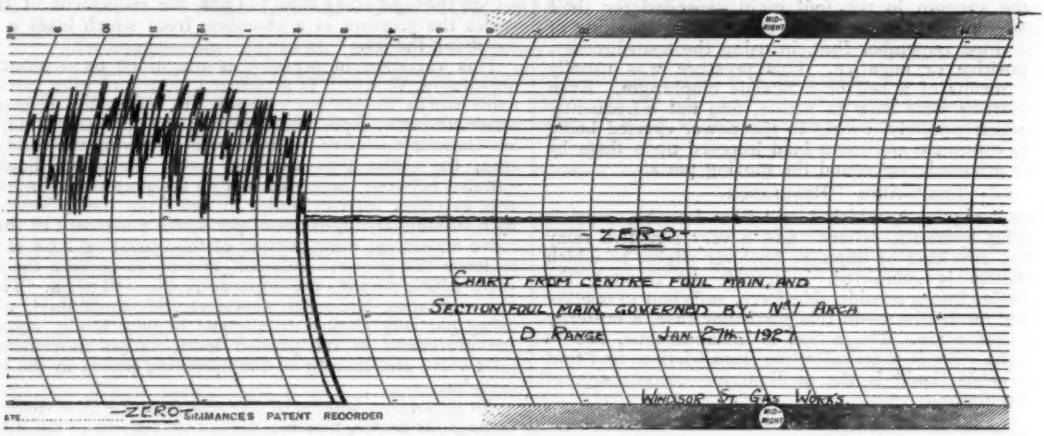
It was decided to use oil as the fluid for operating the relay controls and pressure cylinders; the oil used being known as "Velocette" light oil, supplied by the Vacuum Oil Company. This was stored in a central tank of some 500 gallons capacity, which had free communication with two small tanks, situated one on either side of it. The two small tanks were to receive the oil returned from the regulators. All three tanks were completely covered-in to keep out dust, and were provided with suitable air vent pipes.

The pressure required for working the system was obtained by means of a small Tangye-Duplex type boiler feed pump. Interposed between the pump and the oil feed tank was a filtering arrangement. This consisted of two cast-iron boxes containing cylindrical filters of $\frac{1}{16}$-in. mesh galvanized iron, so arranged with a knuckle joint and wedge that they could quickly be removed from the boxes for cleaning purposes. These two filters were worked in parallel so as to reduce their effect on the suction of the pump.

The pumping plant and filtering arrangement were laid down in duplicate—one set working from each of the side tanks. One pump was in use, and the other was a stand-by, for, of course, one or other of them had to be at work continuously. A branch pipe, in which was fixed a relief valve, was run from the main delivery pipe of the pumps back to the central storage tank. This relief valve was set at 50 lbs. per sq. in., thus giving an oil pressure of about 20 lbs. on the top of the ranges for operating the regulators.

The pumping plant is situated in the centre of the retort house, and a network of flow and return pipes runs to and from the regulators. The piping consists of solid cold-drawn weldless steam quality tubing, with special curved **T** and **Y** branch pieces; the majority of the joints being male and female screwed. The size of the piping varies in diameter from $1\frac{1}{2}$ in., where it leaves the pumps, down to $\frac{3}{4}$ in. at the inlets of the regulators. This variation is arranged gradually as the distance from the pumps increases and the number of regulators served decreases. The size of the return piping to the oil storage tanks naturally increases in like manner from $\frac{3}{4}$ in. at the regulators to $1\frac{1}{2}$ in. where it delivers into the tanks. An important feature in the return piping system is the provision of suitable vent pipes, as the returning oil is not under pressure, and might therefore easily form air locks. A small vent pipe is also fixed in the return pipe, close to each regulator, as well as at frequent intervals throughout the system.

It was decided to arrange matters so that the gas from the



ranges of 5-ton retorts should be delivered into the two side collecting mains, and that from the range of 7-ton retorts into the central main. This was accomplished by closing certain existing valves.

It must be remembered that the object of the installation was to provide automatic vacuum control over each quarter of a range. As the retorts are set in two rows with a foul main above each, it was necessary to split each of these into two independent sections. This could also be done on some ranges by closing existing valves; but in the case of others, blanks had to be inserted in the mains.

Four regulators were then fixed on each range, two at either end, where the section foul mains joined their respective collecting mains, except on the range of 7-ton retorts, where all four were placed in the centre. The "Arca" valves were fixed in the section foul mains in close proximity to the existing hand-operated valves, so that in the event of temporary failure of the regulators, the old system of working could be put into operation.

INITIAL DIFFICULTIES.

I now come to the last part of my paper, which deals with the difficulties at first experienced in working the system, and the benefits resulting from its adoption. The changes in the specific gravity and viscosity of the oil due to variations in temperature constituted one of the most frequent causes of trouble. Several of the instruments are in rather exposed and draughty positions, and, particularly during the winter months, the oil became so thick and sluggish as seriously to affect the working of the apparatus.

In some cases the regulators responded far too slowly to variations in the vacuum, and in others the piston leathers actually became fast in the pressure cylinders. This trouble was largely remedied by lagging the cylinders with strips of wood, and, in the case of those most exposed, running a ⅜-in. steam service inside the lagging, up and down the cylinder in a **U**. This steam service was brought along the oil return pipe, as some difficulty was experienced in very cold weather in getting the oil away.

Unfortunately, while curing this particular trouble, warming the oil tended to aggravate another which already existed—namely, aeration of the oil. This was probably originally accounted for by the cascade effect produced in the return oil piping from the ranges down to the pumping plant—a rather sharp descent of some 25 ft. This aeration of the oil had the effect of causing undue oscillation of the instruments, as well as air locks in the oil return system, despite the vent pipes. Warming the oil undoubtedly increased this trouble, by partially vaporizing the lighter fractions. I wish it to be understood, however, that these troubles were more a source of annoyance than actual disorganization of the system, but they necessitated more supervision of the instruments than was desirable.

After just over twelve months running with oil as the operating fluid for the regulators, it was decided to change over to water. The change-over occupied two or three days, during which time the retort house was controlled by the exhauster throttle regulator as heretofore.

First, all the oil was drained from the piping system, pressure cylinders, &c., and the whole system washed out by circulating a solution of soda water for some 24 hours. Then the soda solution was drained off, and the tanks and instruments were thoroughly cleaned and overhauled. While this was being done, the piping system was steamed for a day or so. Two water filters were introduced, this time on the delivery side of the pumps—one to be in use, and the other as a stand-by. These consist of strong cylindrical galvanized-iron tanks, filled with fine chippings, supported on a layer of ballast. The central storage tank was dispensed with, the two small ones remaining interconnected, as before; one being fitted with a ball-cock feed. With the use of water it is found desirable to employ larger needle valves in the relay controls, and also to work at a lower pressure. This is necessary on account of the higher viscosity of water in comparison with oil; thus making the instruments too lively. Apart from these slight alterations, the system is worked as formerly; but the results have amply justified the change over to water, as the instruments now require little or no attention.

BENEFITS OF THE SYSTEM.

Finally, what are the results and benefits accruing from the adoption of the system of vacuum control that I have described? I shall make no attempt to give you any figures, such as increased make per ton, or even steadier hourly makes of gas. Such figures would only be misleading and really convey nothing. As I stated previously, we are continually carbonizing a very varying mixture of coals, so that with the large number of retorts usually at work it is impossible to give any figures of real value. After all, the main object of the installation is to maintain steady conditions in the various sections of foul main, and thus obtain the best possible results as regards make per ton and C.V., inasmuch as they are affected by this very important item.

Judging from pressure charts, the desired result has been very fairly attained. The charts show clearly the capabilities of the instruments to keep a perfectly steady pressure line within a variation of $\frac{1}{20}$ in. water column. The most interesting and convincing chart shows the exhauster pull in one of the collecting mains as compared with the conditions in the adjoining foul main controlled by the "Arca" regulator. This chart indicates conclusively the sensitive governing powers of the instrument.

I may mention here that the relay device is so sensitive that a movement of half-a-thousandth of an inch on the end of the lever arm is sufficient to change the pressure in the valve chamber and move the pilot valve, so that the piston of the hydraulic cylinder functions in the desired direction. It is also worthy of note that this sensitiveness is obtained without the use of complicated or delicate parts.

Regarding the heavy fluctuations in the exhauster pull, I put this down to the difference between the comparatively slowly acting hydraulic governor on the exhauster throttle controlling a high-speed machine, compared with the very sensitive action of the regulators; also to the fact that there are 24 of these regulators operating in conjunction with the one governor of the exhauster, thus setting up pressure waves in the collecting mains.

Discussion.

Mr. C. F. TOOBY (President) said that he had no experience of the "Arca" regulator for the control of vacuum, though he had it in operation for temperature control. Why was this type of regulator installed instead of the usual type of retort house governor? On the verticals at Coventry, the counterbalanced bell type of retort house governor with "reel" valve was in use with complete satisfaction. The governors required practically no attention; it was only necessary to clean them about once a year. He asked if it was fear of pitch troubles which induced them to instal the "Arca" regulator, or if it was because of the somewhat steadier governing obtained. When considering this question, it was the actual conditions of pressure inside the retort which counted; and even with a perfectly steady vacuum in the foul main, considerable variations of pressure might occur in vertical retorts which were outside the control of the governor. For instance, slight variations in the rate of travel of the charge, "hanging" of the charge, difference in the grading of the coal, and fluctuations in the pressure of steam to the retorts, could easily cause variations of several tenths of an inch water gauge in the retort.

Mr. H. R. HEMS (Senior Vice-President) proposed a vote of thanks to Mr. Corder. He remarked that there seemed to be a general tendency towards automatic regulation at the present time. As a distribution man, he was particularly interested, for the tendency in industrial working was towards the elimination of the human element in controlling temperatures. They had good indicators and recording instruments; and the next step was fine control.

Mr. W. MCNAUGHTON (Wolverhampton), in seconding the vote of thanks, asked whether a constant vacuum was obtained on the top

of the retorts, and whether the "Arca" instruments were installed with this object in view. Had it been found that the scurfing interval was longer since the installation of the control system?

Mr. W. J. PICKERING (Birmingham) supported the vote. He had had no personal experience of the "Arca" regulator, but on the Coal Test Works at Birmingham they were using an "Askania" governor, which was similar, and designed to effect the same end —viz., to bring to each off-take an even control. Their experience had certainly shown that a governing device of this kind was well worth while. In his opinion, the old type of retort house governor was not sufficiently sensitive.

Mr. J. H. THOMAS (Smethwick) asked if the installation of the regulators had affected the nitrogen content of the gas. He, too, was of opinion that the old retort house governor was not sensitive enough, and that a regulator similar to the type described was a necessity, as it was essential that the pull on the off-takes of the retort should be regular.

Mr. A. R. MYHILL (Birmingham) said that to aim at getting a straight line on the foul main was really only to attempt to cure an ill which existed. If a straight line was obtained on the pressure chart, it did not follow that the conditions in the retort were as satisfactory as one might be led to think they were. It was the differential pressure between the outside wall and the inside wall of the retort that mattered. Research ought to be done with a view to finding some impermeable material with which to construct the retorts. The initial outlay on such a retort might be costly, but he felt sure that it would eventually pay from a gas-making point of view. If such a material could be found, which would stand the necessary high temperatures, it would undoubtedly lead to increased thermal efficiencies.

Mr. CORDER, in reply, said that as far as he was aware there were no governors in use in the retort house at Windsor Street prior to the installation of "Arca" regulators. He certainly thought that the old retort house governor was too slow in operation, whereas the action of the "Arca" regulator was instantaneous, and in addition there was little chance of its pitching-up. He thought, too, that it would prove to have a much longer life than an ordinary governor. He had found that the periods between scurfing had been longer since putting in the new regulators, and there had also been an improvement in the steadiness of the calorific value. The nitrogen figures, too, had certainly improved, and were probably 2 to 3 p.ct. lower than before the "Arca" instruments were installed.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Dealing with distribution in a paper at this meeting, Mr. T. V. Blake, of the Cardiff Gas Company, first detailed the considerations and experiments which led them to adopt a 50-50 mixture of paraffin and gas oil for anti-naphthalene spraying. Practical experiences of the internal and external corrosion of iron and steel mains were then related, followed by an interesting account of experiments which showed that carbon monoxide was responsible for an unusual deposit on a consumer's burners. A brief reference was made to deposits in consumers' meters.

A Meeting of the Association was held at the Offices of the Cardiff Gas Light and Coke Company on Saturday, March 5; the members being received by Mr. H. D. Madden, the Engineer and Manager, on behalf of the Chairman and Directors of the Company.

Mr. C. B. FELTON, Junior Vice-President, presided at the general meeting, at which the following paper was read.

NOTES ON DISTRIBUTION.

By T. V. BLAKE, of Cardiff.

SPRAYING.

A successful method of combating naphthalene stoppages and internal corrosion in the distribution system is by saturating the stream of gas with a suitable petroleum oil, atomized in a steam-heated vessel, and also treating the gas prior to storage or distribution. Finding an oil suitable for this purpose requires chemical and physical investigation, as the oil must have the following predominant properties:

(*a*) Low vapour tension.
(*b*) Moderately high boiling-point.
(*c*) Low cost.

Briefly, the most suitable oil for spraying is one which, when atomized in the stream of gas, will be carried forward in the form of minute particles of liquid. Their minuteness militates against mechanical settling-out until they have travelled to the consumers' meters, and have got into the parts where their solvent and surface greasing action (prevention of internal corrosion) is required.

Realizing the requirements demanded of the spraying oil, we conducted experiments with a view to obtaining efficiency at the lowest cost. A petroleum distillate was in use, and worked successfully, but had the objection of being rather expensive. The composition and properties are shown in the following table.

Distillation.

Specific gravity	0·814
Flash point	77° Fahr.
Residue	Trace.
1st drop	208° C.
10 p.ct.	214° C.
20 ,,	222° C.
30 ,,	228° C.
40 ,,	233° C.
50 ,,	239° C.
60 ,,	243° C.
70 ,,	248° C.
80 ,,	255° C.
90 ,,	269° C.
100 ,,	305° C.

Gas oil, which was primarily bought for use on the carburetted water gas plant, offered an advantage with regard to cost. The behaviour of this oil is best observed by comparison with a sample of oily condensate taken from a large meter situated 500 yards from the atomizer.

Distillation.

—	Original Gas Oil.	Sample of Oil from Meter.
Specific gravity	0·890	0·991
Flash point	141° Fahr.	94° Fahr.
Residue	1 p.ct. (semi-solid)	15 p.ct. (coke)

Distillate.	Temperature, ° C.	Distillate.	Temperature, ° C.
1st drop	239	1st drop	132
10 p.ct.	259	10 p.ct.	170
20 ,,	272	20 ,,	188
30 ,,	280	30 ,,	197
40 ,,	289	40 ,,	207
50 ,,	296	50 ,,	215
60 ,,	307	60 ,,	218
70 ,,	334	70 ,,	239
76 ,,	360	80 ,,	268
23 ,,	above 360	85 ,,	281

It will be noticed that the fractions of low boiling-point (having good solvent powers for naphthalene) are thrown down in close proximity to the atomizer, instead of remaining in the stream of gas throughout the distribution area.

The next experiment was to combine the advantages of paraffin and gas oil (of lower specific gravity, but suitable for use on the carburetted water gas plant) by using a mixture—if this could be obtained, and retain homogeneity for a reasonable time by diffusion, which depended to a large extent on their relative specific gravities.

The following mixtures were made, and allowed to stand for five days:

(*a*) Paraffin was poured slowly into an equal volume of gas oil taken from stock. Two layers were formed, and slight diffusion took place.
(*b*) Gas oil was poured slowly into an equal volume of paraffin. Again two layers were formed, which did not appreciably diffuse.
(*c*) Equal volumes were then shaken together. The diffusion was complete and permanent.

This mixture was then decided on for use in the atomizer.

A sample of oil taken from a drip pot situated about 500 yards from the atomizer was tested, and the results were compared with those of the original spraying mixture.

—	Spraying Mixture. 50 P.Ct. Paraffin and 50 P.Ct. Gas Oil.	Sample of Oil from Drip Pot.
Specific gravity	0·837	0 858
Flash point	168° Fahr.	133° Fahr.
Residue	trace	trace

Spraying Mixture. 50 P.Ct. Paraffin and 50 P.Ct. Gas Oil.		Sample of Oil from Drip Pot.	
Distillate.	Temperature, ° C.	Distillate.	Temperature, ° C.
1st drop	190	1st drop	150
10 p.ct.	226	10 p.ct.	181
20 ,,	236	20 ,,	195
30 ,,	245	30 ,,	203
40 ,,	250	40 ,,	208
50 ,,	262	50 ,,	215
60 ,,	264	60 ,,	227
70 ,,	284	70 ,,	238
80 ,,	303	80 ,,	245
90 ,,	333	90 ,,	250
100 ,,	340	100 ,,	264

Again fractions of low boiling-point were thrown down not

far distant from the atomizer, though the general constitution of the oil was better than when gas oil alone was used.

The season being early spring, when naphthalene stoppages are usually prevalent, a test was carried out to discover if the low boiling-point constituents had been used up in dissolving out naphthalene in the mains. Pure naphthalene was added to the same weight of the spraying mixture, and also to the sample taken from the drip pot, maintaining the temperature at normal. The following results were obtained:

The spraying mixture required 11 p.ct. by weight of $C_{10}H_8$ for saturation.

The sample from the drip pot required 3 p.ct. by weight of $C_{10}H_8$ for saturation.

This indicated that the oil deposited in close proximity to the atomizer was 72·7 p.ct. saturated with naphthalene—a good state of affairs for prevention of naphthalene stoppages in domestic fittings.

A sample from domestic meters was then obtained, and compared with the original spraying mixture.

Distillation.

Spraying Mixture. 50 P.Ct. Paraffin and 50 P.Ct. Gas Oil.		Sample of Oil from Consumer's Meter.	
Distillate.	Temperature, °C.	Distillate.	Temperature, °C.
1st drop	190	1st drop	150
10 p.ct.	226	10 p.ct.	183
20 ,,	236	20 ,,	196
30 ,,	245	30 ,,	206
40 ,,	250	40 ,,	220
50 ,,	262	50 ,,	236
60 ,,	264	60 ,,	270
70 ,,	284	70 ,,	354
80 ,,	303	71 ,,	360
90 ,,	333	92 ,,	above 360
100 ,,	340		
Residue . . .	trace	Residue . . .	8 p.ct.

It will be observed that the bulk of the naphthalene solvents in the original spraying mixture has done its work in the mains, leaving the higher boiling constituents (especially above 270° C.) to exercise their lubricating qualities on the diaphragms and moving parts of the meters.

Naphthalene stoppages are infrequently found, which proves the efficacy of this process; and any small deposits are quickly removed by increasing the proportions of paraffin in the spraying mixture.

Internal Corrosion.

The possibilities of internal corrosion by the constituents of gas manufactured under modern conditions are many. Some, or all, of the following constituents can be present in town gas: Water vapour, carbon dioxide, oxygen, carbon monoxide, olefines, methane, hydrogen, nitrogen, sulphur dioxide, hydrocyanic acid, ammonia, and carbon disulphide. Of these twelve constituents, only four have no corrosive action on iron and steel mains—viz., olefines, methane, hydrogen, and nitrogen.

With the exception of carbon monoxide, the presence of aqueous vapour is necessary to facilitate corrosive influence, which is more decisive at the dew-point of the gas. The customary method of storage of gas over water in the holders causes the distributed gas to be more or less saturated with water vapour. Hence the trend of modern experiment (and practical accomplishment) to dehydrate the gas sufficiently to lower the dew-point of the dried gas compatible with seasonable temperatures. There would seem to be a limit to this dehydration process, or the corrosive action of carbon monoxide (the proportion of which tends to increase rather than decrease in town gas) may make its presence manifest.

The renewal of a 6-in. main, over 20 years old, was recently undertaken, the old main being badly corroded—or, in the words of the workmen, "shovelled out." Little leakage was apparent until the clay was disturbed.

Analyses of the solids and liquids in the main were made, with the following results:

Solid Portion.

Iron oxide, Fe_2O_3,	40·40 p.ct.,	equivalent to 28·3 p.ct. iron
Prussian blue, $Fe_3(FeCy_6)_3$,	2·48 ,,	,, ,, 1·1 ,, ,,
Insoluble matter (SiO_2),	51·00 ,,	
Volatile matter (oil),	5 82 ,,	

This analysis illustrates the ravages of corrosion in a marked degree; the percentage of iron in the original pipe (say, 80 to 90 p.ct.) being reduced to 28·3 p.ct., and the increase of the original 5 or 6 p.ct. of silica to ten times that amount, allowance being made for earthy mixture in the corroded pipe. The action of hydrocyanic acid is also pronounced by the proportion of prussian blue obtained.

Liquid Portion.—This consisted chiefly of the residual spray oil; its naphthalene saturation being 56·7 p.ct.

Internal Corrosion of a High-Pressure Steel Main.

A black deposit was found in a drip pot on this main about six miles distant from the works. The analysis of a sample was as follows:

Oil and moisture	31·6 p.ct.
Naphthalene	0·9 ,,
Ferrocyanides	Traces
Carbon (gritty coke-like substance)	9·3 p.ct.
Residue (iron oxide, silica, &c.)	58·2 ,,

This examination points to corrosion having taken place in alternate dry and moist portions of the main; the resultant compounds being carried along and deposited at a low level of the main, and banked up in the drip pot.

Internal Corrosion by Carbon Monoxide.

A 4-in. branch was taken off the high-pressure supply (suitably reduced in pressure), and this line of main terminated by a few lengths of 12-in. main (connected for future linking-up to another district), and capped. A supply of gas to two houses was taken from the 12-in main. A complaint was received from the house near the blank end of the main that the points of combustion of the gas appliances—fire, cooker, and incandescent burners—were coated with a red powder resembling jeweller's rouge, the composition of the mantle being entirely changed, and a dull red light emitted. By bringing a supply from another (more distant) section of the main, normal conditions were obtained.

The red deposit, which on analysis was found to be iron oxide, could not be detected other than at the points of combustion of the gas; and it was impossible to collect any in a supply taken off the cap on the end of the main. This portion of the main is exceptionally dry, owing to altitude; and the gas being initially compressed to 10 to 15 lbs. per sq. in. at the works would enhance this property.

The problem was to explain this phenomenon. Was it the corrosive action of carbon monoxide (which at this time was in greater proportion than usual) on the dry iron of the main, forming a vapour, iron carbonyl, $Fe(CO)_5$, which was carried in the stream of gas and decomposed into iron oxide, Fe_2O_3, at the heated points of combustion of the offending gas appliances?

Theorizing led to experiments being carried out upon an inverted incandescent burner (the clay nozzles and mantles having been previously proved free from iron) by injecting finely-divided particles of different substances into the gas stream leading to the lighted mantle; compounds which were known to be in the main (as the deposit at the drip pot indicated) being employed.

Experiment No. 1.—Iron oxide, as a dry impalpable powder, was injected into the stream of gas leading to the burner under test. This was carried along in the gas stream and simply passed through the mantle into the atmosphere without any deposit being formed on the clay parts of the nozzle and mantle, or any change in colour of the light emitted therefrom being observed. This experiment negatived any assumption that solid iron compounds formed in the main were passing forward to the domestic appliances.

Experiment No. 2.—Prussian blue was then tried, and produced a red stain on the clay nozzle and mantle ring; the light not being perceptibly affected. As ferrocyanides were found to be present in the deposit found at the drip pot, this indicated one probable cause; but the quantity present was too small to qualify this statement.

Experiment No. 3.—Carbon monoxide was injected into the gas stream, and the mixture passed over substances commonly met with in a gas main, with the following results:

(*a*) Over iron oxide (rust)—no deposit formed on clay parts of burner.
(*b*) Over iron filings—ditto.
(*c*) Over iron filings (heated to 80° C.)—red deposit perceptible after half-an-hour.

It would seem that carbon monoxide was a possible cause, since the necessary conditions of Experiment 3 (*c*) were obtaining at the point of combustion of the gas in the usual appliances.

Similar red deposits have been obtained on the burners of gas furnaces where the proportion of carbon monoxide in the gas has been high, and the gas heated before admixture with air for combustion.

External Corrosion of High-Pressure Main.

Indications of serious "pitting" were taking place on the external surface along a line coincident with the horizontal diameter of a 12-in. welded steel high-pressure main, which was laid about six years ago in well punned clay. From the position of the corrosion it appeared that corrosive agents had worked through from the super soil, and had been prevented from reaching the lower semi-circumference of the main by the clay protection.

The composition of the super soil may have been affected by:
(*a*) Top surface of clinker and ashes path.
(*b*) Drainage from a public convenience.

Chemical examination revealed that the chief cause of the

corrosion was that alkaline sulphides were reaching the main from the clinker path above. The earth surrounding the main consisted of a black mass, and contained both sulphide and sulphate of iron, undoubtedly derived from the main. Loose bolted clips were placed around the main; the intervening space being filled with cement. Clay containing no corrosive substances was placed near the main, and well punned to prevent percolation of drainage through from the clinker path above.

DEPOSITS IN CONSUMERS' METERS.

Liquid and solid samples were taken from the outer gas chamber of a consumer's meter, and analyzed.

Liquid Portion.—This was neutral, and contained traces of iron compounds.

Solid Portion.—This was brown in colour, and at first was taken to be rust. Further chemical examination indicated considerable quantities of silica (sand), iron, and alumina (clay). The deterioration of the diaphragms of dry meters was frequent at this time; wear being noted on the portions of which movement was greatest while the meter was working.

The presence of silica and clay in the deposits found in the meter case gave suspicions that the diaphragm dressing (graphite) was responsible for this condition. A sample of the dressing was taken from the diaphragm, and compared with the original compound used for this purpose. The following results were obtained:

Microscopic Examination.

Chemical Analysis.	Original Dressing.	Dressing Taken from Diaphragm.
	Angular Particles Visible.	Angular Particles Visible.
	P.Ct.	P.Ct.
Volatile matter (grease, lamp-black, &c.)	81·7	77·9
Residue	18·3	22·1
Silica in residue	52·6	29·9
Other compounds	..	Tin and lead (from casing and solder)
" "	Iron and alumina (clay)	Iron and alumina (rust and clay)

The examination indicated that the dressing was of mineral origin, and was not sufficiently finely divided for use on meter diaphragms. It was discarded in favour of neutral almond oil or whale oil.

Discussion.

Mr. C. B. FELTON (Newport), proposing a vote of thanks to Mr. Blake, commented on the author's appropriate reference to inter-departmental good feeling, the avoidance of friction, and the consequent saving of money.

Mr. T. H. MADDEN (Cardiff) seconded the vote, and asked why the high-pressure main was pitted, though covered with tarred hessian wrapping.

Mr. B. J. BELL (Cardiff), who supported the vote, said that light paraffins had a deleterious effect on the leathers of the meters by taking out the oils with which they were impregnated. This resulted in a definite hardening of the leathers when they were exposed to the air. The conclusion he had come to was that paraffin was not a proper material for the leathers. Referring to the internal action of carbon monoxide, he asked whether this would not be successfully retarded by the oil film on the main. Was not the red deposit on cooker jet holes due more to rust than to carbon monoxide? With regard to the formation of iron carbonyl, he remarked that red deposits were observed on nozzles and mantles of incandescent burners where bulky forgings were in progress in iron foundries. Referring to the post-war trouble of stoppages in iron pipes, he would like the author to state whether or not he had formed any opinion of the relative defects of iron pipe as compared with compo pipe. With regard to the presence of silica clay deposits in the meter, was it there in any considerable proportion? The amount of graphite used in meter dressings was slight; and there might be another cause. Though costly, there was no finer dressing for leathers than almond oil.

Mr. H. D. MADDEN said that corrosion could be retarded by filming the internal surface of the main with paraffin. With regard to the siliceous deposits found in meters, these might be due to the film of silica (left on the main pipe after being cast in the sand mould) becoming detached and being carried forward with the stream of gas. His practice was thoroughly to soak the inside of the service pipes with otherwise waste heavy engine oil. Many years ago he had a great deal of trouble with naphthalene deposits, but complaints now were extremely rare.

Mr. G. H. HUGHES (Chepstow) inquired whether the carcassing of the house was carried out with iron or compo piping, as the use of iron in close proximity to the burners might have localized the formation of iron carbonyl. He also asked about the internal white deposits to be found in compo piping, and the deposits on the external portions of gas-steam radiators. He referred to the popularity of the new slotted type boiling burner.

Mr. W. E. CROWLEY (Newport) asked whether the paraffin used was ordinary commercial paraffin oil.

Mr. T. V. BLAKE, replying, said there were two objects in employing paraffin and gas oil mixture. The lighter fractions brought down naphthalene in the mains to the drip pots. The heavier fractions were carried forward to the meters, and helped lubrication of the diaphragms. The graphite dressing was a war-time necessity, when almond oil and whale oil were unobtainable. He agreed with Mr. Bell that good natural almond oil was an excellent dressing, though it had come to his notice that whale oil was equally as good, and cost half as much. The pitting of the high-pressure main took place in alkaline soils, which would attack and destroy first the wrapping, and then the main. He agreed that an oil film would go far to protect the internal surface of a gas main from all the impurities mentioned. The usual practice at Cardiff was to lay an iron service from the main to the consumers' meters; the carcassing then being carried out with compo piping. The white deposits found in compo piping consisted of lead cyanide and lead sulphite. The deposits on gas-steam radiators were the ash of ignited dust, and oxidized sulphur compounds of iron. The slotted type of burner had the advantage over the drilled type in that it concentrated heat under the vessel to be heated. Drilled burners were now seldom constructed other than for simmering purposes, when the gas jets were of small volume. The paraffin used for spraying was of similar composition to commercial paraffin oil, but consisted of a complete fraction of crude petroleum.

GAS-WORKS PRACTICE.

The lecturer on Monday of last week, in the course on "Modern Developments in Regard to Fuel" at the Sir John Cass Technical Institute, Jewry Street, E.C., was Dr. HAROLD G. COLMAN, who took for his subject "Gas-Works Practice."

In his opening remarks, the lecturer pointed out that gas-works practice has altered very considerably of recent years. This was due partly to the introduction of new methods of manufacture, but mainly to the fact that the nature and composition of the gas which was most suitable for public use had undergone substantial change. The last century, so far as gas supply was concerned, could be divided into four periods: The pioneer period; the first competition period—*i.e.*, one gas company with another; the monopoly period; and the renewed competition period, from 1882, when electricity was introduced, and there was also kerosene. During all this time, there had been steady improvement in methods of manufacture; and in spite of the competition of electricity and kerosene, the consumption of gas had continued to go up, and the price to go down. This went on right up to the date of the war.

Prior to 1880 gas had practically been employed only for lighting; and it was the new uses which came along about that time which subsequently so greatly increased the demand. Then, as the incandescent burner developed in the last part of the century, some 95 p.ct. of the gas was used for purposes in which the calorific power was of primary importance. Eventually the Gas Regulation Act removed the illuminating power restrictions, and placed the supply of gas on a calorific basis. The change in the requirements of consumers which had thus come about in the last quarter-of-a-century, had led to great activity on the manufacturing side of the industry, which would not have developed in the manner it had done if the gas had continued to be supplied for illumination by flat-flame burners alone. From the beginning of the industry up to 1900, remarkably little change took place in manufacturing plant.

Illustrations were shown on the screen of Murdoch's retorts—1801, 1802, 1804, 1805. The earliest was a vertical retort, and the second a horizontal one. Then there was a sketch of a direct-fired setting of seven retorts, dated about 1850. Then came the introduction of stoking machinery, regenerative settings, and, at the end of last century, inclined retorts. Early in the present century, a really big change in the type of plant used for carbonizing coal occurred, with the coming into use of Glover-West and Woodall-Duckham continuous vertical retorts. The result of carbonizing in a continuous vertical retort, said Dr. Colman, is that the composition of the gas remains uniform; the character of the tar is distinctly different from that formed in horizontal retorts; and the quality of the coke also is different. The Dessau intermittent-vertical retort is greatly favoured in Germany. The coke made in this way is harder and denser even than that from horizontal retorts. The lighter coke from continuous verticals is, however, generally preferred in England; while the other kind appears to be more suitable for the different needs of Germany. In the Woodall-Duckham intermittent vertical chambers, one chamber takes the place of three retorts. The Munich inclined chamber is extensively used in Germany; while there are also in this country, and in Germany, horizontal chambers.

Something like one-half of the gas produced in this country is probably still made in horizontal retorts. There has been no definite change in principle in horizontal retorts; nevertheless, much improved working is being obtained from them. This is owing partly to greatly increased attention to detail. For one thing, the retorts are charged more fully, which has led to a great improvement in average results.

Attention was drawn to the provision of waste-heat boilers in connection with gas manufacturing plants, and to the production of water gas, both in carbonizing retorts and by separate apparatus.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Blackburn Gas-Works.

This visit, which took place on Saturday, March 19, had been postponed from last May, by reason of the coal strike. The party met at the railway station, and were conveyed by special tramcar to the tram shed of the Blackburn Corporation. Here they were welcomed by Mr. Seymour (General Manager of the Tramways Department) and shown the special heating installation, which is "all gas." There is one B6 Bonecourt gas fired boiler for heatintg the large shed, while in the dining-room a Richmond double oven, an "Ironclad" boiler for domestic water, and a Jackson boiler for the brewing of tea are provided. In the stores and office a two-tier Keith boiler is installed; the machine shop has a Keith three-tier boiler; the paint shop two three-tier Keith boilers; and there is a three-tier boiler for domestic work and the washing of cars.

Leaving the sheds by tram, the next visit was to the gas-works.* Here the visitors were welcomed by the Chairman (Councillor E. Hamer, J.P.), the Vice-Chairman (Alderman Sharples), and the Gas Engineer (Mr. G. P. Mitchell). The guides who conducted the party round the works were Mr. J. D. Ashworth (Assistant Engineer), and Messrs. Ogden, Jamieson, Aspin, Taylor, Colwin, and Leather.

Tea was served in the works recreation room, when ninety persons were present.

Councillor Hamer spoke in high terms of the work of the Association and the benefits that were to be derived from visits to various undertakings. As Chairman, he said he was proud of their works, and of what they had accomplished during the last seven or eight years.

Mr. Haynes (Bolton) moved a vote of thanks to the hosts, and remarked upon the splendid works they had seen. It appeared that the Engineer got the best out of his staff and workmen.

Mr. Mitchell was pleased to hear that the work of the last seven years had been so much appreciated. He acknowledged the support that had been given him by the Chairman, Vice-Chairman, and members of the Committee, and by his staff.

The showrooms were afterwards visited; and a tour of the gas exhibiton brought a successful meeting to a close.

* A description of the works appears in another part of this issue.

ATMOSPHERIC POLLUTION.

There has been issued by H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, and Branches (at the price of 6s. 6d. net, postage 2d. extra), the twelfth report of the Advisory Committee on Atmospheric Pollution, of which Dr. J. S. Owens—who has devoted so many years to this particular subject—is Hon. Secretary. It gives an account of the work of the Committee during the twelve months ended March 31 last year.

The first of the four sections into which the report is divided is devoted to the measurement of impurities deposited from the atmosphere as obtained by the standard gauge. During the year 61 gauges were in use—an increase of 12 over the previous year—29 authorities co-operating in the collection of data. At about two-thirds of the stations the amount of impurity deposited during the year was less than the average for the previous five years; while in one-third it was greater. In the second section are particulars relating to the impurity suspended in the air as measured by the automatic filter. This instrument is in operation at Victoria Street, South Kensington, Kew Observatory, Blackburn, and Stoke-on-Trent. At Victoria Street and South Kensington the percentage of hazy days was definitely higher than in the previous year; but at Blackburn and Stoke-on-Trent it was lower.

Obstruction of Ultra-Violet Radiation by Smoke.

Among various researches carried out, an attempt has been made to correlate the obstruction of ultra-violet radiation as measured by Prof. Leonard Hill's acetone blue method with the quantity of suspended impurity in the air. For this purpose the intensities of ultra-violet radiation from the sun as measured at Kingsway and Greenwich have been compared with the suspended impurity as measured at Westminster. To eliminate the effect of cloud as far as possible, a selection was first made of all days during which the sky was not more than one-quarter covered with cloud. During these days the average amount of suspended impurity as measured by the automatic recorder, between sunrise and sunset, was plotted with the ultra-violet radiation received.

From the results, the report states, it is evident that there is a close relation between the amount of ultra-violet radiation received on the ground and the freedom from smoke pollution. As it is impossible to eliminate entirely the effect of cloud, the relation thus brought out cannot be expected to follow any definite law; but the obstruction due to smoke impurity is clearly of considerable importance.

REGISTER OF PATENTS.

Suspended Lamps.—No. 264,898.

Evered & Co., Ltd., of Smethwick, and Barnes, F. V., of Todmorden.

No. 26,164; Oct. 20, 1925.

The aim of this invention is to prevent any unauthorized persons tampering with the lamps, and also to provide a positive support when the lamp is in its normal fully-raised position. The raising and lowering winch is disposed in a casing containing the clock control or manually operable control valve, so that it can only be manipulated by the person authorized to effect the setting or actuation of the control means.

Secured between the jaws of the lamp supporting member and above the pulley carried thereby is an upwardly extending arm provided adjacent the upper end thereof with outwardly projecting pins adapted, when the lamp is being raised into its normal position, to contact with the surfaces of a pair of vertically disposed cam-like members provided with slots therein. When the lamp is being raised these pins ride up the cam surfaces until they reach the mouth of the slots; and as the suspension of the lamp is so determined that the lamp swings inwardly relatively to the lamp standard when freely suspended, the pins engage within the slots. The winch is then operated to lower the lamp slightly, when the pins rest in the bottom of the slots and thus constitute a positive support for the lamp.

Gas Ovens.—No. 264,982.

Ruth, H. W., of Lewisham.

No. 31,309; Dec. 11, 1925.

This invention simply comprises hinged baffle plates, attached to a frame, which serve to direct the gases to the centre of the oven. These plates are fitted above the oven burners, and extend from front to back of the oven.

Gas Burners.—No. 265,041.

Frankfurter Gasgesellschaft and Schumacher, E., both of Frankfurt.

No. 9760; April 13, 1926.

This invention consists of a burner utilizing a high-pressure gas-air mixture. The burning mixture is maintained out of contact with the object to be heated, but in contact with refractory material. The heating, therefore, is primarily by radiation. The combustion products are given a whirling motion between the refractory and the object to be heated, so that their sensible heat assists in the heating of the object.

Low-Temperature Carbonization.—No. 265,435.

Meiro, A., of Brussels.

No. 12,313; May 12, 1926.

The powdered fuel is mixed with a liquid—*e.g.*, mineral oil—having a boiling point which exceeds the temperature of volatilization of the products to be obtained from the fuel, and this liquid is utilized for carrying the fuel through a series of retorts, which may be heated to temperatures gradually increasing from one retort to the next. The volatile matter released from the fuel is extracted by the vehicular liquid, and is progressively distilled.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 16.]

Nos. 6247—6998.

Bamag-Meguin Akt.-Ges.—"Apparatus for low-temperature distillation." No. 6809.
Bomcke, K.—"Gas purifying apparatus." No. 6419.
Carpenter, C.—"Treating gases with solids." No. 6852.
Conrad, E.—"Devices for igniting unburned gas." No. 6286.
Deutsche Erdol Akt.-Ges.—See Bomcke, K. No. 6419.
Doherty, D. L. M.—"Regulating supply of gas to burners." No. 6592.
Dvorkovitz, P.—"Treatment of carbonaceous matter." No. 6453.
Graesser-Monsanto Chemical Works, Ltd.—"Treatment of tar oils, &c." No. 6383
Heller, O.—See Bamag-Meguin Akt.-Ges. No. 6809.
Hinchley, J. W.—"Gas fires." No. 6247.
Hofmann, A.—See Conrad, E. No. 6286.
Humphrey, H. A.—"Production of coke in briquette form." No. 6832.
Kohlenveredlung Akt.-Ges.—"Producing illuminating, &c., gas." No. 6297.
Kohlenveredlung Akt.-Ges.—"Gas generators." No. 6298.
Koks-und Halbkoks Brikettierungs Ges.—"Production of semi-coke briquettes." No. 6609.
Mather, E.—See Graesser-Monsanto Chemical Works, Ltd. No. 6383.
Plassmann, J.—"Low-temperature distillation of fuels." No. 6596.
South Metropolitan Gas Company.—See Carpenter, C. No. 6852.
Synthetic Ammonia and Nitrates, Ltd.—See Humphrey, H. A. No. 6832.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Commercial Gas Bill: Reported that opposition to the Bill was withdrawn; previous Order made discharged; and Bill committed.

Farnham Gas and Electricity Bill: Brought from the Commons; read the first time, and referred to the Examiners.

Salford Corporation and Scarborough Gas Company (Consolidation) Bills: Select Committee appointed; to meet on Tuesday, May 10.

Special Orders.

Budleigh Salterton, Uxbridge, Maidenhead, Wycombe and District, and Earby and Thornton Gas Orders: Referred to the Special Orders Committee.

Hastings Electricity (Extension) Special Order.

The Special Orders Committee reported that they had examined the Hastings Electricity (Extension) Special Order, and that a petition against the Order had been presented by the Hastings and St. Leonards Gas Company. After consideration of the points referred to in sub-section (6) of Standing Order 191, they were of opinion that there was no necessity for a further inquiry by a Select Committee.

HOUSE OF COMMONS.

Progress of Bills.

Budleigh Salterton, Earby and Thornton, and Uxbridge, Maidenhead, Wycombe, and District Gas Orders: Copies presented.

Farnham Gas and Electricity Bill: Read the third time, and passed.

Matlocks Urban District Council Bill: Reported, with amendments, from the Local Legislation Committee.

Reading Gas Bill: As amended, considered; read the third time, and passed.

THE MATLOCKS URBAN DISTRICT COUNCIL BILL.

The gas provisions in the Matlocks Urban District Council Bill were considered by Section B of the Local Legislation Committee of the House of Commons (presided over by Mr. RAINE) on Tuesday, March 15. (These provisions were set out in the "JOURNAL" for Jan. 19, p. 145.)

Mr. G. H. KEEN stated that the clause to extend the limits for the supply of gas by the Council to include the parish of Dethick Lea and Holloway, in the rural district of Belper, had been deleted from the Bill. Dealing with the change-over to the thermal system of charging, he said that at present the maximum price which could be charged by the Council was 5s. 6d. per 1000 c.ft.; and this price was actually being charged. It was proposed by the Bill to supply gas at 500 B.Th.U., and that the maximum price should be 1s. 2d. per therm; it being provided also that the Council should not at any time charge consumers of gas within that portion of the limits which is beyond the urban district a price higher than that charged to consumers within the district in like circumstances. The maximum price of 1s. 2d. per therm for a 500 B.Th.U. gas was equivalent to 5s. 10d. per 1000 c.ft., so that the maximum price would be increased by 4d. per 1000 c.ft. This increase of the maximum price was the subject of a report from the Ministry of Health; but Counsel pointed out to the Committee that the maximum price of the Matlock and District Gas Company, who supplied gas within part of the urban district, was 6s. 1d., the actual price charged being 5s. 9d. per 1000 c.ft.

Mr. PALIN (a member of the Committee) asked if it were the immediate intention of the Council to charge the equivalent of 5s. 10d.

Mr. KEEN replied that it was not.

Mr. *Arthur Collins*, Financial Adviser to Local Authorities, gave evidence with regard to the financial provisions, and said that the increase of 4d. in the maximum price was necessary in order to ensure that the undertaking should be self-supporting. He also pointed out that, in considering the change-over from the volumetric to the thermal system of charging, the Board of Trade almost invariably fixed the maximum price at the nearest penny to the calculated maximum; they did not like decimal points. He referred to figures regarding the finances of the undertaking for the past ten years. In seven of those years there had been a profit, and in three there had been a loss. The profit last year was £851; but it was doubtful if there would be a profit this year.

The CHAIRMAN said that if, in the current year, the undertaking showed no profit and no loss on the basis of 5s. 6d. per 1000 c.ft., the extra 4d. would place them in a good position. Did witness think it reasonable to assume that if the increase of the maximum price were granted it would not lead to increased charges?

Witness said he thought the Council would not increase the price to the maximum.

Mr. *E. Randle* (Accountant to the Gas Committee) also gave evidence. The limits of supply for gas, he said, would remain as at present; but in the Bill they were defined anew, consequent upon the extension of the urban district.

The clause giving power to make a minimum charge for prepayment supplies (as quoted in the "JOURNAL" for Jan. 19) was deleted from the Bill, in accordance with a suggestion made by the Board of Trade.

Witness said the Matlock and District Gas Company supplied gas of a calorific value of 500 B.Th.U., so that there would be uniformity in the district.

At the instance of the Railway Companies, a proviso was added to a clause giving the Council power to enter into contracts with regard to bulk supplies; the object of this proviso being to prevent the Council from supplying gas under bulk supply contracts beyond the limits of supply if, and so long as, such supply would interfere with the supply of gas within the limits. The proviso had been added to similar clauses in other Bills.

With regard to a clause giving power to supply the owners or occupiers of premises in private streets within the gas limits but beyond the urban district, Counsel said that this power was asked for because, although there was a provision in the Public Health Act enabling local authorities to lay pipes in private streets, that might not apply to the gas limits beyond the district.

A number of clauses of a general character, relating to such matters as relief from obligation to supply gas, the mode of cutting-off supplies, the provision of showrooms and offices, charges for special readings of meters, power to compel repairs of piping and appliances in a dangerous condition, &c., were the subject of a report from the Ministry of Health. The Ministry stated that there were no precedents in the Local Acts for those clauses; but they understood from the Board of Trade that there was no objection to them on merits. It was pointed out, however, that several of them—such as that giving power to open showrooms and offices—might lead to considerable expenditure; and others—such as that compelling repairs of apparatus—might lead to interference with the existing rights of consumers. It was pointed out also that none of these modern provisions was in force in the Gas Company's area, so that their adoption by the Council could not be said to promote uniformity throughout the urban district; and it was suggested that they be omitted.

A representative of the Ministry was in the room, but did not press the matter further.

Mr. KEEN objected to the suggestion that the Council should not be able to adopt improved machinery because the Gas Company had not adopted it; and he pointed out that the Gas Company had not been to Parliament for 23 years.

A number of questions were asked by the Committee as to the advisability of granting power to provide a showroom.

The CHAIRMAN said the Committee had been told that the profit last year was £851, and that it was doubtful if there would be a profit this year. In three years out of the last ten there had been a loss. How was it possible, therefore, to run a showroom? The Council would have to obtain premises, they would have to burn gas in their showroom in order to demonstrate their apparatus, and would have to provide a staff.

Mr. KEEN said that when gas undertakings ran showrooms they did it with the object of increasing the sale of gas.

The CHAIRMAN replied that that was all right in a big town; but this was not a big town. The Committee did not wish unduly to restrict the Council; but they wanted to be sure that a showroom would not result in an extra charge upon the consumers.

Finally the clause was passed, with an amendment to the effect that, if the power to open a showroom were used, a room should be provided in the Pavilion at Matlock Bath for the purpose.

The other clauses were also approved.

HASTINGS ELECTRICITY (EXTENSION) SPECIAL ORDER, 1927.

Hastings and St. Leonards Gas Company's Objection.

The Hastings and St. Leonards Gas Company, in their capacity of ratepayers in the borough of Hastings, asked the Special Orders Committee of the House of Lords, on Tuesday, March 15, to recommend to the House that further inquiry should be made into the Hastings Electricity (Extension) Special Order, 1927, before it receives Parliamentary approval. The purpose of the Order is to extend the area for the supply of electricity by the Hastings Corporation; and the Company are apprehensive that, as the result of this extension of area, the Corporation might incur losses the burden of which would fall upon the ratepayers. Therefore they asked for the opportunity to place before Parliament their claim for the insertion of what has come to be known as the "Northumberland" or "Winchester" clause, which would afford protection to ratepayers against any loss which might be incurred by the Corporation as the result of the supply of electricity by them.

The Special Order was made, in the first place, by the Electricity Commissioners under the Electricity (Supply) Acts, 1882 to 1926, and has been confirmed by the Minister of Transport under the Electricity (Supply) Act, 1919. It now awaits parliamentary approval. The Special Orders Committee of the House of Lords, over which the Earl of Donoughmore (Lord Chairman of Committees) presides, is a Committee whose duty it is to examine Special Orders made by Ministerial Departments when presented to the House for approval, and to recommend to the House the course which should be adopted with regard to them. They were therefore not concerned with the merits of the Order. Their business was to decide whether further inquiry was necessary, in view of the previous history of the case. A petition was presented by the Company, in which they stated their case, and another, in reply to it, was submitted on behalf of the Corporation.

The Company were represented by Mr. S. E. CASH (of Messrs. Vizard, Oldham, Crowder, & Cash, Parliamentary Agents), and the Corporation by Colonel G. COX (of Messrs. Dyson, Bell, & Co., Parliamentary Agents).

Mr. CASH quoted at length from the petition, giving the Committee, at the same time, authorities for the statements made in it. The petition pointed out that the Order proposed to extend the area of the Corporation for the supply of electricity to include the borough of Rye, the urban district of Battle, the rural districts of Hastings,

Rye, and Battle, and the parish of Ninfield, in the rural district of Hailsham. The Company supplied gas in the borough of Hastings and various outlying places, including some of those comprising the added area for the supply of electricity by the Corporation. The Company were one of the largest ratepayers in the borough, and were competitors with the Corporation in part of the added area; and they alleged that their property, rights, and interests would be injuriously affected by the Order. Therefore, they objected to it.

By the Hastings Corporation Electric Lighting Order, 1898, the Corporation were authorized to supply electricity in the borough of Hastings; and the Hastings Corporation Act of 1924 conferred further powers upon them relating to the electricity undertaking. The Company had opposed the 1924 Bill in both Houses of Parliament, and had endeavoured to obtain the insertion of the "Northumberland" or "Winchester" clause. During the proceedings on that Bill, the Corporation had stated that their electricity undertaking was working at a profit; and at that time they were affording a supply in bulk to Bexhill outside their area, from their new power station. The price of that supply was an uneconomic one. In 1924 the Company were not aware of the proposal to extend the area of supply in the manner proposed by the present Order. Though it was admitted at a local inquiry into the Order, held in November, 1925, that at the time of the promotion of the Bill for the 1924 Act the Corporation had in mind the extension of area now proposed. No reference to this fact was made before the Committee of either House of Parliament in 1924; and consequently, the Company submitted, they did not obtain the insertion of the "Northumberland" or "Winchester" clause in that Act.

It appeared at that inquiry that the scheme of the Corporation was not well conceived, inasmuch as it would not be self-supporting; it being admitted by the Corporation that there would be a loss during the first few years. In the estimate of the financial position none of the capital charges relating to their generating station were provided for in connection with the added area; the view of the Corporation being that, as those overhead charges had to be borne in any event by their existing undertaking, there was no need to put any charge upon the price of current in the added area. The estimates of revenue submitted at the inquiry were quite haphazard, as they were based on population, and depended largely upon whether the only big works in the added area—a gypsum mine—would take a supply of current. The evidence of the owners of this mine was that if they could get electricity at a cheap price they might take a supply. The Company believed that a cheap price would mean a price less than 1½d. per unit, which would be less than cost. The added area was very scattered; and evidence had been given that the population in the rural portion was decreasing rather than increasing.

The Company pointed out that, quite apart from any question of loss in relation to the proposed extension of area, there was a deficiency at present of some £23,000 on the working of the existing electricity undertaking. It was admitted at the inquiry that within five years the capacity of the generating station would only be sufficient to meet the needs of Hastings coupled with the supply to Bexhill, even if there were no added area. Therefore, with the added area, further capital expenditure on the generating station would be necessary at an early date; and unless the charge to consumers in the added area included overhead charges, there would of necessity be a loss, which would fall upon the ratepayers of Hastings. The Company submitted that a burden ought not to be placed upon these ratepayers in order that a supply of electricity should be furnished to the added area. Moreover, under the Electricity (Supply) Act, 1926, the new Electricity Board, if they utilized the power station at Hastings as a selected station, could obtain electricity from that station at a proper price, and could make arrangements for a supply to the added area. This would appear to be the proper course.

The Company pointed out further that the ratepayers of Hastings had had no opportunity of expressing their opinion as to whether or not they were in favour of the scheme. If the Order were allowed to pass without the "Northumberland" or "Winchester" clause being inserted, it would reverse what was the practice of Parliament prior to the appointment of the Electricity Commissioners. The fifth annual report of the Commissioners stated that they had decided to modify the prior practice, and normally to disallow the clause when applied for, unless a good case for its insertion were made out by the parties desiring its insertion, thereby (the petition stated) shifting the proof of burden from the promoters to the opponents. The Company submitted that the reversal of a course adopted by Parliament for many years should be allowed only after consideration by Committees of Parliament. The Corporation should not be allowed to embark upon an unremunerative speculation for the benefit of consumers outside the borough, unless provisions were inserted for a revision of the prices charged for energy, so that no contribution would be required from the rates of the borough.

The statement made to the Committee on behalf of the Corporation in reply to the petition was then dealt with. In this it was stated that, when the Corporation applied for the Order, the Company lodged objections, and the Electricity Commissioners caused a local inquiry to be held by their Chief Engineering Inspector, at which the case in opposition to the Order and in support of the insertion of the "Northumberland" clause was fully heard. After full consideration of the report of their Inspector, the Commissioners determined to grant the Order without the insertion of the "Northumberland" clause. The Order was submitted to the Minister of Transport for confirmation; but the Company presented a memorial praying that the Order should not be confirmed, and again asking for the insertion of the clause. The Minister caused an inquiry to be held into the memorial, at which the Company were again afforded every opportunity of submitting their case. But the Minister confirmed the Order without the insertion of the clause; and the Order was now submitted for the approval of Parliament. Committees of both the House of Lords and the House of Commons had refused to insert the clause in the Corporation's 1924 Bill. The Corporation could not make any reference to the proposed promotion of the present Order during the proceedings on the 1924 Bill, for the reason that it was not until Jan. 2, 1925, that they decided to promote the Order. As to the Company's suggestion that the scheme would not be self-supporting during the first few years, the Corporation submitted that, in the initial stages of their existence, public utility services were seldom self-supporting; but they were convinced that within a comparatively short time the scheme would not only be self-supporting, but would be profitable. The Corporation figures had been accepted both by the Electricity Commissioners and by the Minister of Transport.

The total amount received from the rates by the electricity undertaking was £35,232, all of which was earlier than 1920. Since April 1, 1921, the undertaking had transferred in aid of rates £12,140, leaving a net deficiency of £23,092. As against this deficiency, there must in fairness be set off the reserve fund of the undertaking, which at March 31, 1926, totalled £25,904; and at the same date there was an unappropriated profit to the credit of the undertaking of £6731. The theory that surplus generating capacity should not be utilized to meet a present demand for energy, for fear that the ratepayers concerned might be called upon to find money in the future for the purpose of extending their generating plant to meet the then demand for electrical energy, was, the Corporation submitted, entirely unsound. As and when the demand for energy arose on a reasonably remunerative basis, it would appear to be in the public interest to make such extensions of generating capacity as might be necessary to cope with this demand. The Corporation submitted that the Company had misapprehended the scope of the powers and duties of the Central Electricity Board under the Electricity (Supply) Act, 1926—this duty being defined by section 2 of that Act as the duty of supplying electricity to authorized undertakers, such as the Corporation.

The suggestion that it was the practice of Parliament to require the insertion of the "Northumberland" clause was inconsistent with the Company's own statement that the insertion was refused in the case of the Hastings Corporation Act, 1924. There was precedent, apart from Hastings, for the refusal of the clause by Parliament. There was no requirement of the general law or in the statutory rules regulating the application for Electric Lighting Orders that the approval of the ratepayers must be obtained. It was open to dissentient ratepayers, however, to oppose the Order; and opportunity to do so was taken by certain ratepayers who appeared at the original local inquiry, in addition to the Gas Company. The said ratepayers, other than the Gas Company, had not pursued their opposition before either the Minister of Transport or Parliament. The Corporation submitted that no question of principle arose in connection with the Order, as, though the Electricity Commissioners and the Minister of Transport had both refused to apply the "Northumberland" clause in the present case, in another contested case heard by the Minister at about the same time the Minister had, in fact, inserted the clause.

Finally, the Corporation submitted (1) that the petition disclosed no substantial grounds for complaint; (2) that the subject-matter of the Order had been so dealt with upon departmental inquiries that further inquiry was unnecessary; (3) that the submissions in the petition of the Company were brought before, and fully heard by, the Electricity Commissioners and the Minister of Transport; and (4) that there were no other circumstances of the case which necessitated further inquiry by a Select Committee of the House.

At the conclusion of Mr. Cash's address,

The Chairman announced the Committee's decision to report to the House that further inquiry was unnecessary. The Committee, he said, had read both statements, and it was not requisite for Colonel Cox to reply.

LEEDS CORPORATION BILL.

Section A of the Local Legislation Committee of the House of Commons (over which Sir Thomas Robinson presides) considered last week the Leeds Corporation Bill—see "Journal" for Jan. 19, p. 145. The clauses providing for the extension of the boundaries of the city were approved, except that the part relating to the inclusion of the urban district of Gilderstone was struck out of the Bill. The clauses relating to the gas undertaking were considered on Thursday, March 17.

Mr. *J. H. Brearley*, Consulting Engineer, giving evidence in support of them, said the undertaking of the Crossgates, Halton, and Seacroft Gas Company, Ltd., which the Corporation proposed to purchase, was of considerable and increasing value. The works and mains were in good condition, and the gas was supplied at the reasonable price of 9d. per therm. The area supplied by the Company, half of which was within Leeds, was developing rapidly; and the demand for gas was increasing. The Company had got through the coal stoppage without raising the price of gas; and so far as he knew, no other Yorkshire gas undertaking had done this.

Mr. *Arthur Collins*, Financial Adviser to Local Authorities, gave evidence with regard to the financial provisions. The cost to the Corporation of the Company's undertaking would be £56,000: and, on past and present records, the undertaking should yield sufficient profit to enable the Corporation to pay the interest and sinking fund charges, while in addition, as the district was developing, the value of the undertaking would improve, and the city of Leeds would get the benefit. From the point of view of the Company, he considered the price a full but fair one, in view of the fact that it had not yet reached its maximum earning capacity. The Corporation had no right of compulsory acquisition; but the arrangements which had been made would give them full control over the gas supply in their own area. The price to be charged in the added areas would be uniform with the charge in Leeds. Gas at 3s. 9d. per 1000 c.ft. was cheaper for domestic purposes than electricity at 1d. per unit.

The Warrenpoint (Co. Down) Gas Company have declared a dividend of 5 p.ct. on last year's working.

LEGAL INTELLIGENCE.

WORKMEN'S COMPENSATION ACT CLAIM.

Commercial Gas Company's Application.

In the Bow County Court, on Monday, March 14, before Judge Hargreaves, there was an application under the Workmen's Compensation Act by the Commercial Gas Company, for a diminution of the award of 30s. a week which had been made in favour of Henry Horwood, of Poplar.

Mr. ROWLAND THOMAS appeared on behalf of the applicants; and Mr. DUNCAN for the respondent.

Mr. THOMAS said that the application of Horwood for the continuation of his 30s. a week was made before Judge Snagge on Jan. 14 (see "JOURNAL" for Jan. 19, p. 152); and eventually it was agreed that the application should be acceded to with the addition of the words "during total incapacity." At that time the Company were alleging that he was fit for light work, which they had since offered him, but he had refused to do. It was clear that Judge Snagge felt that the Company were in the right, as he awarded no costs against them. The man lost the index finger of his left hand; and the work offered him as light work was to chip cement off old bricks. But the man suggested that he would not be able to use the chopper, owing to the loss of the finger. The work offered him would have brought in £3 os. 4d. a week; and the difference between the wages he had earned and that amount was 18s. 10d., so that all they were legally called upon to pay was 9s. 5d. a week. The answer to the application of the Gas Company contained one very peculiar sentence. It said: "Employers—it did not refer to the Gas Company as the employers—take back their workmen on so-called light work, and then discharge them with a view to evading their liability to redeem for a lump sum of money." After the decision of Judge Snagge, they offered the man light work. There was a conversation over the telephone with the solicitors; and it was suggested that he would return if he was given a lump sum. This, however, the Company refused.

Mr. DUNCAN: This has been sprung as a surprise on me. Light work usually brings in half a man's wages; but if this is to be £3 os. 4d. a week, he is willing to attempt to do it. I will here and now accept the £3 os. 4d. and the difference in compensation of 9s. 5d. a week.

Mr. THOMAS: I cannot do that now, after the scandalous attack made by this firm of solicitors. The case must be tried out. There has been a steady refusal on the part of the man to do this light work.

Mr. *Percy Edwin Williams*, the Works Engineer, said he had on many occasions definitely offered Horwood light work.

Mr. DUNCAN: Are you aware that if you got him back for a week or two you could dismiss him?

Witness: We could give him a week's notice, of course; but we always take back our injured and look after them.

Dr. *Frederick Spur* then gave evidence, and said that as far back as Nov. 29 the respondent's doctor and himself agreed that the man was fit for light work.

Mr. DUNCAN: The light work that is offered is bogus light work, because they already have men doing the work.

Judge HARGREAVES: No. I gather from their offer that they would find him a job; and if they could not, he would get his money for nothing.

Judge HARGREAVES, in giving his decision, said it was clear the man could do light work, and that it had been offered him. His delayed recovery appeared to be due to his wanting to see how much he could get as a lump sum. He would have to find that the man was capable of doing this light work, as from Feb. 10; and from that time he was entitled to 9s. 5d. a week compensation. This would be his award; the applicants giving an undertaking to find the man light work at £3 os. 4d. a week.

MR. GEORGE HELPS' BANKRUPTCY.

Public Examination.

The adjourned public examination of Mr. George Helps, of Nuneaton (see "JOURNAL" for Jan. 19, p. 151), took place at the Coventry Bankruptcy Court, on March 14, before the Registrar, Mr. C. A. Kirby.

The first examination was conducted in January. Debtor's statement of affairs showed a surplus of £60,158 10s., but debtor stated that this sum included the value of shares he held in Companies in which he had had transactions in relation to gas production patents—Pleno, Ltd., and Gas Distribution, Ltd.

Mr. J. J. Williams, the Town Clerk of Oldham, represented the Oldham Corporation, and Mr. Hobley (Coventry) appeared for the debtor.

The OFFICIAL RECEIVER (Mr. J. C. Band) reminded debtor that at the January examination he asked a few questions about his present position with the Nuneaton Gas Company. Would he tell the Court what his salary was at the present time?

Mr. *Helps* replied that he thought he told the Court it was about £700. Asked if this represented salary and commission, he replied that it was salary only, and was based at £5 per million c.ft. of gas made. The quantity varied slightly. He received nothing from the Company beyond his salary. He was not entitled to royalties or any other sum from them. They had the benefit of his inventions, and paid a royalty; but he did not get it.

The OFFICIAL RECEIVER: To whom do they pay it?

Mr. *Helps:* It has changed about a bit. The agreement by which they paid a royalty belonged first of all to Pleno, Ltd. I cannot tell you how it happened, but it was transferred to someone else, and is at present held by Mr. Phillips.

When Pleno, Ltd., received the royalty, how much did it amount to roughly?—£600 or £700 a year.

How long has Mr. Phillips held it?—About 18 months. I am speaking from memory.

Did Mr. Phillips purchase the right from Pleno, Ltd.?—No, he purchased it from me or my wife. I could not tell you definitely in whose name it was at the time.

Did it ever belong to Pleno, Ltd.?—I think I am right in saying that it did.

If it did, how could Mr. Phillips acquire it from you or your wife?—He acquired it some time ago—not from Pleno, Ltd.

Mr. *Helps*, in replying to further questions, said there was a monetary consideration when the transfer was made, from him or his wife, but he could not say what it was. There would be an agreement in writing, and the consideration was still being paid.

Asked if it was an actual consignment or simply a charge on the money coming from the Nuneaton Gas Company, he said it was done through a solicitor in the usual way, and made over in proper form.

The TOWN CLERK OF OLDHAM also asked Mr. Helps a number of questions. In reply to these, the latter stated that he was not getting commission from the Nuneaton Gas Company about two years ago, apart from his salary. Speaking from memory he would say that he had never had any commission from the Nuneaton Gas Company.

Mr. WILLIAMS: Have you ever suggested that your income from the Nuneaton Gas Company was from £1500 to £2000 a year?

Mr. *Helps:* Never.

You have had your present salary for some years?—Yes.

What else have you been entitled to from the Nuneaton Gas Company besides your salary?—Nothing.

Mr. *Helps*, asked whether he had any inventions used by the Gas Company, replied that he had; but his interest in them was transferred to Pleno, Ltd., when the Company was started. The transaction with Pleno, Ltd., took place about 1920. He could not have had any commission in 1919. He took shares in Pleno, Ltd., when the various agreements were transferred to them. Whether there was any exception in the case of the Nuneaton Gas Company, he could not say.

Mr. WILLIAMS observed that this was unsatisfactory.

Mr. *Helps* replied that, had he known these questions would be asked, he could have referred to the papers. There had been so many transactions that he would not like to speak definitely about any one of them. At that particular time he assigned thirty other agreements, each of which he thought would represent several thousands of pounds a year to him, so that the one with Nuneaton was regarded as a small matter.

Mr. *Helps*, questioned as to whether he thought Pleno, Ltd., would get the benefit of his other inventions, said he certainly thought they would. He would not be entitled to anything in respect of the patent from the Nuneaton Gas Company. He was expecting an income in the near future from the others using his patents, and he was anticipating the pleasure and privilege of collecting some from the Oldham Corporation.

Mr. WILLIAMS: If you can persuade the Judge to give you the privilege, Oldham will be pleased to pay.

The OFFICIAL RECEIVER said there was no reason why the case should be kept open; and the REGISTRAR said the examination would be concluded.

GAS COMPANY'S APPLICATION TO SUPPLY ELECTRICITY.

In the Chancery Division on Friday (March 11) Mr. Justice Astbury assented in an application by the Tenby Gas Consumers' Company, Ltd., for leave to alter the constitution of the Company to enable it to carry on an electricity supply business as well as gas supply. Mr. Cecil Turner, for the Company, stated that his clients were an old-standing concern of 50 years' public service, and they desired to take advantage of, and benefit from, an Order of the Electricity Commissioners. Permission was granted.

Lyme Regis Electricity Figures.—Speaking in the Lyme Regis Town Council on March 14, Col. Hines mentioned the interesting fact that their electricity was costing 9d. per unit; this being made up as follows: Generating, 2·64d.; distribution, 0·08d.; management, 0·86d.; sundries, 1·21d.; interest on loan, 1·58d.; sinking fund, 2·64d.; and income-tax, 0·25d. They were selling it at 4d. per unit, and did not want people to use too much.

Research and the Metal Industries.—An exhibition which has been arranged and opened to the public at the Science Museum, South Kensington, affords some indication of the assistance given to British metal industries by the research and auxiliary services of an industrial research organization. The exhibit is that of the British Non-Ferrous Metals Research Association, who, with the co-operation of the industry through membership of the Association, carry on a two-fold service—first, in the prosecution of research work either of a fundamental and scientific character or of direct practical utility; and, secondly, in maintaining a highly organized information service which operates for the general benefit of the Association as a whole, and meets the specific needs of individual member firms. The present exhibit is concerned chiefly with eight of the Association's researches, chosen from among eighteen major investigations at present in progress. Those selected are typical of the character and wide range of the work which is being carried out; and the exhibits have been set out to give some idea of the scope of each piece of work, and the progress which has so far been made. The exhibition is open to the public daily; and literature descriptive of the material on view, and of the other work being carried out by the Association, may be obtained at the Science Museum or from the Secretary, British Non-Ferrous Metals Research Association, 71, Temple Row, Birmingham.

MISCELLANEOUS NEWS.

SHEFFIELD GAS COMPANY.

Coke Oven Gas for Town Supplies.

At the Meeting of the Company on Monday, March 14, Colonel H. K. STEPHENSON, D.S.O. (the Chairman), who presided, made reference to various matters of interest. He first of all explained that the sales of gas had again increased by over 5 p.ct.; and after payment of the dividends, there would remain a balance of £69,321 to be carried forward. He did not know of any gas undertaking which, as the result of the prolonged stoppage, had made so small a demand on the pockets of its consumers, or suffered so small a disturbance of its own financial position, as their Company. These favourable results were not due to the fact that they did not suffer the same inconvenience as other undertakings, but, he ventured to claim, to their greater foresight and superior management. In the first place, they accumulated before the stoppage the largest stock of coal which they had ever held; and in order that this might be used to the best purpose, they began as early as July to purchase outcrop coal to mix with it. During the stoppage of 1921, the demand for gas decreased; but in the 1926 stoppage increases in gas consumption soon began to take place, and in some weeks the increase was as much as 25 p.ct. The Company's usual supplies of coke oven gas, amounting to 5,500,000 c.ft. per day, ceased at the commencement of the stoppage; and on this account alone they had to carbonize 400 tons of coal a day more than customary. Before the stoppage was over, the Board found it necessary to increase the price of gas, first by 2d. per 1000 c.ft., and later by a further 4d., making in the circumstances the very modest total increase of 6d. Seeing that the first increase was not made until September, and that on average the whole increase was now coming off, no part of this increase would have been paid by the consumers for so long a period as that of the coal stoppage itself.

POTENTIALITIES OF COKE OVEN GAS.

Alluding to the question of coke oven gas, the Chairman said: No doubt, many of you will have noticed that a Committee has been appointed by the Government to investigate the use of fuels; and I hope that in the course of its deliberations it will pay special attention to the question of coke oven gas, not only from the point of view of the gas supply of the country, but also as a means of conservation of coal. Our Company at present take 5,500,000 c.ft. per day of this gas, and have been doing so for a number of years. When I tell you that this is by far the largest amount taken by any gas undertaking—in fact I believe I am correct in claiming that it is nearly as much as is taken by all the other gas undertakings in the country put together—you will realize the importance which we attach to this supply. So satisfied are we with its convenience, that we are proposing to enter into an agreement for a further supply of coke oven gas equal to 3,500,000 c.ft. per day, as from the autumn of 1928—making with our present contracts a total quantity of 9,000,000 c.ft. per day.

I am quite sure that at the present time the potentialities of coke oven gas, as regards the general gas supply of the country, have not received the attention they deserve; and subject to continuity of supply being guaranteed during stoppage periods, as provided for in our new agreement, there should be no difficulty in making arrangements mutually satisfactory to gas and coke oven undertakings, as well as of the utmost benefit to the community at large. It would be far more profitable for coke oven producers to sell their gas to gas undertakings for 6d. per 1000 c.ft. than to use it themselves, as it is generally understood that it is not worth to them more than 3d. Obviously such arrangements could only be made by large gas undertakings like our own, which are in a position to take the whole of the surplus gas from each installation throughout the year. As I mentioned in my speech last year, it is no more difficult to extend the supply of gas than of electricity through a large area of country; and the absorption of many small gas undertakings, which are now charging prohibitive prices for gas, by an undertaking like ours would have the effect of not only reducing the price and thereby increasing the demand for gas, but also opening-up intervening areas of country which at present have no supplies at all. I need scarcely add that if ever the surplus coke oven gas is to be fully utilized it must be purchased and handled by gas undertakings, who are alone in a position to deal with it efficiently—in the best interests not only of gas consumers, but also of fuel and power economy.

CHEAP GAS.

The Board have, the Chairman went on, decided to reduce the price of gas, as from this month's meter readings, from 3s. 5d. per 1000 c.ft., or 8½d. per therm, to 3s. 1d. per 1000 c.ft., or 7⅝d. per therm, decreasing by a gradual scale on quantity to 1s. 6d. per 1000 c.ft., or 3⅞d. per therm, for large consumers. It is hoped by these reductions not only to benefit the domestic consumer, but also to do something to help Sheffield trade. These reductions will make the Sheffield prices the lowest in the country, and will mean a saving to the consumers of approximately £80,000 per annum. People do not always fully appreciate the advantages they derive from a well-managed company run on strictly commercial lines, as compared with a municipal undertaking. An interim dividend at the rate of 5¾ p.ct. per annum has already been paid; and the Board recommend that a final dividend be paid at the same rate, making 5¾ p.ct. for the year—the same as a year ago. The co-partner employees of the Company will also receive the same bonus as last year.

PROGRESS MADE.

The mains and services have been extended on the Manor, Wybourn, and Dykes Hall Corporation Housing Estates; and arrangements have been made to supply the Longley Estate as this is developed. In the case of the Wybourn Estate gas is the only means of illumination, and the streets will be lighted with gas lamps. This means that every householder on the estate will be a gas consumer. In a general way nearly all the houses now being built by private enterprise are being supplied with gas for cooking, room heating, or water heating. The alterations to the showrooms were completed, and the new portion opened to the public, in June. One section is devoted to the exhibition of gas appliances for industrial and domestic purposes. The other section is so arranged that it can be completely shut-off from the rest of the premises and used as a lecture room. The amount of work executed in the fittings department has been well maintained. The demand for gas appliances during the period of the coal dispute was such that the greatest difficulty was experienced in meeting it. The demand for water-heating appliances of all kinds continues, and an increasing number of inquiries is being received for installations of the "all-gas type," or a combination of gas cooking and water heating by means of a coke-fired boiler. In most of the new property now being erected the builders arrange to put in supply pipes for gas fires, and claim payment for these under the scheme. Prepayment installations are still in request; and during the year some 5268 of these meters have been fixed. The total number of prepayment installations at the end of the year was 20,640. It may surprise some people to learn that gas as an illuminant is still holding its own, and that no fewer than 5090 one-light pendants and brackets were sold during the past year. The number of appliances sold outright at the showrooms, not including those on "simple" hire, was: Gas fires and radiators, 3279; circulators, geysers, and wash boilers, 516; cookers, both hire-purchase and cash sales, 1981; oven squares, 1454; hotplates, boiler burners, and grillers, 2401. In spite of the Government's encouragement of electricity, we have records of 110 consumers reverting from electricity to gas.

For the results achieved, I cannot praise too highly the work of the General Manager (Mr. Ralph Halkett) and his devoted staff, as well as of the general body of employees, who have all worked as though the undertaking belonged to them—as, indeed, under the co-partnership scheme, it in a great measure does.

REDUCTIONS IN THE PRICE OF GAS.

In Coleraine the price is being reduced from 5s. 10d. to 4s. 2d. per 1000 c.ft.

A reduction of 2d. per therm, as from the reading of the meters for the current quarter, has been announced by the Directors of the East Cowes Gas Company. This brings the price to 1s. per therm.

A reduction is taking place in Lisburn of 1s. 6d. per 1000 c.ft.

After the meter reading commencing April 1, the price of gas will be reduced by the Londonderry Gas Light Company to 10½d. per therm (4s. 4½d. per 1000 c.ft.).

The Plymouth and Stonehouse Gas Light and Coke Company announce a reduction, as from the readings of the meters at Lady-day, of 1·7d. per therm, equivalent to 7·65d. per 1000 c.ft. The revised charges for Plymouth and Stonehouse, Plympton, and the outlying districts will be 7·3d. per therm for ordinary consumption (2s. 8·85d. per 1000 c.ft.) and 6·7d. per therm for engine consumption (2s. 6·15d. per 1000 c.ft.).

The Stretford and District Gas Board have decided to reduce the price by 1d. per therm. The reduction will take effect after March 31.

MANCHESTER METER TESTING STATION.

Visit by Chairmen of Gas Undertakings.

A party of between forty and fifty chairmen of North of England gas undertakings on Tuesday, March 15, inspected the department of the Gas Meter Testing Committee of the Manchester City Justices, and were afterwards entertained at luncheon at the Town Hall by the Lord Mayor (Alderman J. H. Swales). The Lord Mayor was in London, and in his absence Alderman F. J. WEST took the chair.

Mr. H. N. BARROW (the Chairman of the Committee), who proposed the toast of "The Visitors," said it was a curious thing that, while an independent authority stood between gas suppliers and gas consumers to test the meters in use, no such authority existed to see justice done in the supply of electricity. No doubt this would be remedied in time. Meanwhile, the Manchester Testing Department was doing most valuable work. Between 70,000 and 80,000 meters passed through the station every year; and many of them came from towns far away.

Sir JAMES FROST (the Chairman of the Chester Gas Company) said all the visitors had been impressed with what they had seen at the testing station.

Alderman T. COOK (the Chairman of the Manchester Gas Committee) said that during the coal strike gas proved to be a fine friend.

Sir THOMAS ROWBOTHAM (the Chairman of the Stockport gas undertaking) and Alderman POLLARD (the Chairman of the Oldham Gas Committee) also acknowledged the toast.

Alderman WEST, who expressed the Lord Mayor's regrets at being unable to attend, said that in the last twenty-three years gas undertakings in this country had increased their output by 85 p.ct. This was wonderful progress, considering that the industry was ninety years old in the early part of this century.

Leatherhead Preference Stock Tenders.—Tenders for the £20,000 of 6½ p.ct. redeemable preference stock asked for by Messrs. A. & W. Richards on behalf of the Directors of the Leatherhead Gas and Lighting Company were largely in excess of the amount offered. The tenders ranged from £102 down to the minimum.

GAS COMPANIES' RESULTS FOR 1926.

Cork.

At the Ordinary General Meeting of the Cork Gas Consumers' Company—Mr. W. B. Harrington, Chairman, presiding—the following report was submitted: "Compared with the corresponding period in 1925, there has been a considerable increase in the rental account, principally due to the increased sale of gas for cooking and heating purposes during the time of the coal strike. The return from residual products also shows a substantial improvement, mainly owing to the great demand for coke, especially for household purposes. After placing £1347 to the credit of the depreciation fund, the balance of profit and loss is £4678, with which we propose to pay the usual dividend at the rate of 8 p.ct. per annum." The Chairman, in moving the adoption of the report and statement of accounts, said it was pleasing to be able to report that the result of the half-year's working had been satisfactory, despite the coal strike. The sale of gas was exceedingly large, being 18¼ p.ct. more than in the corresponding period of the previous year, which was then the highest on record. There was also a good return from the sale of residuals, chiefly due to the increased demand for coke. On the other hand, the cost of coal was considerably higher. When the strike began, they had a large stock of coal—sufficient for nearly four months of ordinary consumption. Increased demand for gas as the strike dragged on was a factor they had to deal with. In order to maintain the supply, they had to decide on the purchase of foreign coal, and they were fortunate in being able to book before the great advance in prices took place. With this additional coal they were in a position not only to maintain the full supply of gas to their own customers, but also to spare coal for six Southern Ireland gas undertakings, as well as for several local industries. Altogether, the half-year's results were gratifying; and the Directors hoped to reduce the price of gas next July, and also to begin paying to the shareholders, with the August dividend, something on account of the previous year, when they were unable to pay the full rate of dividend. A dividend of 8 p.ct. per annum was declared.

Crowborough.

Presiding at the annual meeting of the Crowborough Gas and Electricity Company, Mr. G. W. Howard, the Chairman, said there was an increase in gas sales of 8·7 p.ct., and in electricity sales of 54 p.ct. A dividend at the rate of 5¼ p.ct. per annum was declared, and £7547 was carried forward, against £5294 the year before.

Dublin.

The half-yearly report of the Directors to Dec. 31 last shows a profit on the revenue account of £31,557. After providing for interest on debenture stock, interest on temporary loans, and income-tax, there remains the sum of £22,939, to which must be added the sum of £34,765—the balance brought forward from last account—making a total of £57,704. The Directors recommend the declaration of a dividend on the consolidated ordinary stock at the rate of 7 p.ct. per annum, less income-tax, which will absorb £54,315, after which a balance of £3389 will remain to be carried to the next account. The sales of gas, showing the remarkable increase of nearly 20 p.ct. on the corresponding period, appear to justify the decision to reduce the price during the progress of the miners' strike, and the present recommendation to increase the dividend, notwithstanding the diminution of the revenue profit caused by the greatly enhanced cost of foreign coal.

Halstead.

The Halstead Gas Company, Ltd., held their annual meeting on March 10. The Chairman (Col. P. Adams) remarked that, in spite of the worst year in the gas industry, so far as coal supplies were concerned, the undertaking had done exceedingly well. The main factor in assisting to this end was the installing of a "Simplex" water gas plant in July last, which had saved a very large amount of coal. The usual dividends of 6 and 5 p.ct. were declared. The price of gas was reduced at Christmas; and it is hoped to get back to the pre-strike rate early this year.

Oxford.

Presiding at the annual meeting of the Oxford Gas Light and Coke Company, Alderman F. W. Ansell, J.P., the Chairman, referred to the fact that, owing to the coal strike, it had been necessary to increase the price by 1d. per therm from September, and by ½d. from December. The latter increase would be taken off after the March meter readings, and the former from the end of June. There was a substantial increase—6 p.ct.—in the consumption of gas during the year. He moved the payment of the full statutory dividend of 5 p.ct. per annum on the preference stock, and a dividend of 10 p.ct. per annum on the ordinary stock for the half-year ended Dec. 31. This was seconded by Mr. H. J. Bradley.

Sandown.

An increase of over 16 p.ct. in the quantity of gas sold was experienced during the past year by the Sandown Gas and Coke Company, Ltd.; and the present year has started with equally good promise. Dividends have been declared at the rates of 11 p.ct. on the original shares and £7 14s. p.ct. on the additional shares. At the meeting, the Chairman (Mr. Arthur Douglas) said that in the sale of gas appliances a record had been established which reflected the utility of the showrooms.

Seaham Harbour.

The Seaham Gas and Lighting Company, at their annual meeting, declared a dividend of 8 p.ct. on the "A" stock and "B" shares, 6 p.ct. on the "C" stock, and 4 p.ct. on the preference stock. The Chairman (Mr. Malcolm Dillon) stated that, owing to the position created by the coal stoppage, the Directors had increased the price of gas to the maximum permitted under the Company's Act—namely, 13·4d. per therm—but they hoped to announce a reduction shortly to the pre-strike price of 1s. per therm.

Sittingbourne.

The result of the year's working is an available balance of £9244, out of which the Directors recommended the payment of dividends of 7½ p.ct. on the original ordinary shares, and 5¼ p.ct. on the additional ordinary shares. This left £5839 to be carried forward to the next account. To cope with the continued development of the business, premises have been acquired in Sittingbourne High Street, for new showrooms.

Southampton.

At the annual meeting of the Southampton Gaslight and Coke Company on March 16, Mr. J. C. Moberly, M.A., the Chairman, said that the increase in the cost of coal, due to the strike, was £47,000. As a result the Board were obliged to raise the price by 6d. per 1000 c.ft. last October, and by a further 6d. at the end of the year. They were, however, going to lower the price by 6d. from the April collection; and they hoped to reduce it by a further 6d. three months later. The gross profit for the year was £3668 less than in 1925, and there was only £826 to carry forward. The business during 1926 had been very satisfactory. Additional consumers totalled 2200, 10¾ miles of mains were laid, and 1353 cookers, 1088 fires, 1024 geysers, and 712 coppers were hired or sold. A dividend of 5 p.ct. was declared.

Ventnor.

The cost of the miners' strike to the Ventnor Gas and Water Company was minimized by the provision of extra stocks of British coal prior to the start of the stoppage; but, nevertheless, it was necessary to increase the price of gas towards the end of 1926 by a total of 5d. per therm, 1d. of which is to be taken off from the March quarter meter readings. A dividend is being paid for the year of 8 p.ct. on the original capital shares, and £5 12s. p.ct. on the additional capital shares, less income-tax.

Watford.

In spite of the coal strike the supply of gas was maintained, and the amount sold was 10·75 p.ct. in excess of the quantity in 1925. The price was raised by 1d. per therm as from the September meter readings. Interim dividends of 4 p.ct. on the "A" and £3 5s. p.ct. on the "B" stock, less income-tax, were paid in August last; and at the annual meeting final dividends at the same rates were declared, making 8 p.ct. and 6½ p.ct. respectively. Mr. E. J. Slinn, the Chairman, mentioned that the Company had commenced the supply of gas in bulk in the district of another neighbouring undertaking. Since 1912 the output of gas by the Company had almost doubled.

Wellingborough.

The effects of the coal strike are naturally seen in the accounts of the Wellingborough Gas Light Company, Ltd. The Directors regarded it as their duty to ensure for the consumers a cheap and unrestricted supply of gas; and their success in carrying out this policy did much to mitigate locally the inconvenience caused by the stoppage. The extra expense entailed in the necessary purchase of large quantities of high-priced and inferior coal was over £11,600. The price of gas was raised by 5d. per 1000 c.ft. from Oct. 1; and the Directors regret that the present scale must be maintained until June 30, when, in the absence of unforeseen circumstances, the price will be reduced. Dividends of 7½ p.ct. on the original and 6 p.ct. on the additional shares, less income-tax, for the half-year, leave a balance of £2873 to be carried forward.

Weston-super-Mare.

At the annual meeting of the Weston-super-Mare Gaslight Company, the Chairman (Mr. J. E. Norman) said that the gross profits were £9839—nearly £6000 less than last year. Bearing in mind the trying conditions of 1926, the Directors considered this exceedingly satisfactory. A reduction of 1½d. per therm in the price of gas had been announced to take effect from the end of the current quarter. Dividends were declared of 5 p.ct. on the ordinary stock, 6⅛ p.ct. on the 6⅛ p.ct. redeemable preference stock, and 6 p.ct. on the 6 p.ct. redeemable preference stock, less income-tax, for the half-year ended Dec. 31.

Weymouth.

The excellent increase of 8 p.ct. in gas sales was recorded for the final half-year, making a total increase for 1926 of 5·4 p.ct. The Directors did not increase the price of gas, in spite of the strike. The revenue showed a loss for the half-year ended Dec. 31 of £1453. The available balance at the credit of net revenue account was £12,254; and a dividend at the maximum rate of 5 p.ct. per annum, less income-tax, was declared.

Winchester.

The Directors, in their report for the half-year ended Dec. 31, stated that the balance of net revenue available for dividend, after transferring £250 to the reserve fund account, was £6864. They recommended the payment of dividends on the preference stock at the rate of 4 and 5¼ p.ct. per annum respectively, less income-tax, and on the consolidated ordinary stock at the rate of 5 p.ct. per annum, less income-tax, for the half-year. The sale of gas during the half-year increased by 9·4 p.ct. over the corresponding half-year of 1925. The Directors reduced the price of gas on March 1 by 1d. per therm, making it 1s. 1d. per therm—the price charged prior to the coal strike.

Windermere.

The accounts of the Windermere District Gas and Water Company for the six months to Dec. 31 disclose satisfactory results, though to meet the heavy expenditure incurred by the purchasing of coal during the strike it was necessary to increase the price of gas to 6s. per 1000 c.ft. from the reading of the meters for the September quarter. On the gas capital ordinary shares a dividend at the rate of 6 p.ct. per annum is being paid, and on the water ordinary shares 7 p.ct. per annum—both less income-tax.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Half-Yearly Meeting of the Company was held on Jan. 28—Sir JOHN HIGGINS (Deputy-Chairman of Directors) presiding.

The DEPUTY-CHAIRMAN said that it was a matter of gratification to the Directors that they could again report an increase in the output of gas. The total quantity sold for the half-year was 2078 million c.ft., compared with 1989 millions for the corresponding half of 1925—an increase of 89 millions, or 4·5 p.ct. Taking the whole year 1926 in comparison with the year 1925, the sales were greater by 148 million c.ft., or 3·8 p.ct. From coke, tar, and sulphate of ammonia, the receipts were £176,395, compared with £156,304 for the December half of 1925—an increase of £20,091, which must be regarded as satisfactory. Profits for the half-year amounted to £134,805. From this sum transfers of £42,000 had been made to the reserve fund, and £10,000 to the meter renewal fund, leaving, after payment of the dividend of £82,500, a balance of £305 to be added to the carry-forward. The number of meters standing fixed at Dec. 31 last was 177,529, compared with 173,198 at June 30—an increase for the half-year of 4331.

FITZROY WORKS.

Compared with the other manufacturing stations of the Company, carbonizing operations at the Fitzroy Works had for many years been carried on at an excessive cost, principally due to the high expenses of carting coal thereto from the Company's coaling berths at West Melbourne and Port Melbourne. The Directors had on a number of occasions considered the advisability of closing-down these works, but hitherto action had been deferred on account of the difficulty of providing for the extra make of gas at the other works, owing to the rapidly increasing demand. The quantity of gas manufactured at Fitzroy was, however, gradually reduced until the proportion for the half-year ended June, 1926, was under 3 p.ct. of the total quantity made. As the programme of works reconstruction was nearing completion, the Board in May last decided to continue manufacturing operations at Fitzroy, but only until the winter ended; and as the plant at the West and South Melbourne Works was capable of supplying all requirements, carbonizing at Fitzroy was discontinued.

STOVE AND FITTINGS DEPARTMENT.

Highly satisfactory results attended the activities of the stove and fittings department during the year. A total of 9280 gas cooking stoves was disposed of, as against 7669 for the previous twelve months—a net increase of 21 p.ct. Another feature of the year's operations was the extensive business done in heavy-duty cooking appliances. New installations or additions to equipment were supplied to no fewer than 96 establishments, such as clubs, hospitals, hotels, colleges, staff kitchens, cafés, &c.; and gas was now almost invariably adopted as a fuel for heavy-duty cooking requirements. In addition to the regular weekly cookery demonstrations at the Head Office, 34 evening demonstrations had been held in various suburbs. Several schools of domestic economy had been furnished with complete gas equipment; and additional heat treatment furnaces were installed at a number of technical schools. Two lady stove instructors called on purchasers of new stoves; and advice and directions on the method of obtaining the best results from the use of gas cookers had been given. This form of practical instruction was much appreciated by users of stoves and appliances, and could not result other than beneficially to the Company. The output of industrial appliances continued to make steady progress.

Mr. ASHLEY LAMB moved, and Mr. JOHN G. CHARLES seconded, that a dividend of 7s. 6d. per share be declared out of the profits for the half-year ended Dec. 31, 1926, on shares issued prior to Aug. 31.

TRADE NOTES.

Change of Address.

From yesterday, the address of Sensible Heat Distillation, Ltd., and "L & N" Coal Distillation, Ltd., is York Mansion, Petty France, S.W. (near St. James' Park Station).

Woodall-Duckham Verticals for Lewes.

The Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., have received an order from the Lewes Gas Company for an installation of continuously working vertical retorts. This will consist of six 53 in. retorts, together with the necessary coal and coke handling machinery. The carbonizing capacity will be 28 tons of Durham coal per 24 hours. The design of the plant is such that it will be possible to instal a waste-heat boiler at a later date.

Vaughan Pulleys and Jibs.

An interesting illustrated brochure describing their pulley-blocks, travelling trolleys, travelling jibs and cat-heads, and chain slings and grabs has been published by the Vaughan Crane Company, Ltd., of Manchester.

Boiler for Whaley Bridge.

In connection with the new works to be erected by the Chapel Whaley and District Gas Company, at Whaley Bridge, Messrs. Ratcliffe & Sons (Hawarden), Ltd., are supplying one of their guaranteed second-hand Lancashire boilers, 24 ft. long by 7 ft. 6 in. in diameter, made in 1914 by Messrs. Daniel Adamson & Co., Ltd., Dukinfield, and passed by the Gas Company's Insurance Company with a clean report for a daily working pressure of 2000 lbs. per sq. in.

CONTRACTS OPEN.

Boiler.

The Sleaford Gas Company are inviting tenders for the supply and setting of a Cornish boiler. [See advert. on p. 763.]

IF YOU KEEP A DOG

you need not do your own

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A GLANCE SHOWS YOUR ACTUAL CALORIFIC VALUE, WHICH IS ACCURATELY TESTED AND RECORDED.

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KIRKE PATENT WASTE HEAT BOILERS

have been installed at gasworks in the following places on

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BECTON, BOXHILL, N.S.W., BRECON, BRIGHTON & HOVE, BROMLEY (repeat), CROYDON, KNOWLE, OMORI (Japan), PORTSMOUTH, RETFORD, STRATFORD, E., STRETFORD, TOTTENHAM (two repeats), WELLINGBORO'.

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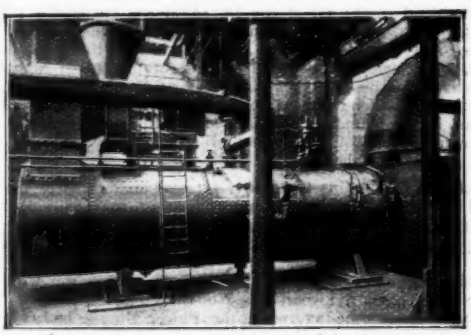

Up to 5¾ lbs. of Steam per lb. of Coke put into the Producers have been obtained from Non-Regenerative Horizontal Retorts by means of these Boilers.

Up to 4 lbs. of Steam per lb. of Coke put into the Producers have been obtained from Regenerative Horizontal Retorts by means of these Boilers.

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which proves the presence of Recoverable Waste Heat in ALL Horizontal Settings, provided that excessive air-infiltration is prevented.

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'Phone: VICTORIA 2802-3.

AUSTRALIAN GAS LIGHT COMPANY.

The Annual Meeting (adjourned) of the Company was held in Sydney, on Feb. 10—Mr. GEORGE J. COHEN (Chairman) presiding.

The GENERAL MANAGER AND SECRETARY (Mr. Andrew Wilson, M.I.E.Aust.) submitted the Directors' statement recommending the payment of a dividend for the half-year of 4 p.ct. on the old "A" and "B" shares, and in proportion on the new "A" shares.

The net profits for the half-year ended Dec. 31, including the balance brought forward, amounted to £162,303; and the balance carried forward was £23,547.

On the motion of the CHAIRMAN, seconded by Mr. CONSETT STEPHEN, the statement was unanimously adopted.

A vote of thanks was accorded the Directors and Officers for their efficient management of the Company's business during the past half-year.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

Dull and idle conditions continue, and immediate prospects are not regarded hopefully. Quotations generally are as low as costs permit, and still export business is not attracted. Output is being restricted by short-time working, which is necessitated by a dearth of orders. Unfortunately the inevitable effect of this is to increase the costs of production per ton. Producers and merchants still hope that the worst has been seen; but there are as yet no signs of any improvement. It would certainly appear that Durham and Northumberland have not been able to reduce costs sufficiently to give them any advantage over foreign rivals in Continental markets. Reports from South Wales are to the effect that matters have improved considerably there in the last few weeks, and this, together with various rumours of possible strikes in America and other countries, is the chief encouragement which this market can see at present.

Wear Special gas makes quote 17s. 6d. f.o.b., and best qualities ask 16s. 6d. to 17s. 6d. Seconds are quoted at 15s. 6d. to 16s. Durham coking is weak at 15s. to 16s.

Coke is not quite so firm, and production seems now to be overtaking consumption. Gas coke is still quoted 23s. 6d. f.o.b.; but patent foundry makes have increased output, and are more plentiful.

YORKSHIRE AND LANCASHIRE.

Gas coals in Yorkshire and Lancashire are inclined to be weak.

With a lack of export orders for screened coal, the home market is rather easy. There is still no great indication of a revival among the "key" consuming industries, and prices are steady. The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 21s. 9d. to 21s. 10½d.; screened gas coal, 21s. 9d. to 22s. 6d.; washed trebles, 22s. to 23s.; washed doubles, 20s. to 20s. 6d.; washed singles, 18s. 9d. to 19s. 3d.; washed smalls, 15s. 9d. to 16s. 3d.; rough slack, 13s. to 13s. 3d.; smithy peas, 22s. to 25s. per ton. West Yorkshire—Hartleys (f.o.b. Goole), 19s. to 22s.; washed trebles, 20s. to 22s.; washed doubles, 19s. 6d. to 20s. 6d.; washed singles, 18s. to 19s.; washed smalls, 15s. to 15s. 6d.; unwashed trebles, 20s. 3d. to 21s.; unwashed doubles, 17s. to 17s. 6d.; rough slack, 13s. to 13s. 6d.; coking smalls, 12s. to 13s. per ton. Derbyshire and Nottinghamshire—Top hards, 22s. 9d. to 25s.; washed trebles, 22s. to 23s.; washed doubles, 20s. to 21s.; washed singles, 19s. 6d. to 20s.; washed smalls, 15s. 6d. to 16s.; unwashed doubles, 19s. to 20s.; rough slack, 13s. to 14s. 6d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 18s. to 20s.; gas coke, 25s. to 30s.; furnace coke, 28s. to 30s. per ton.

MIDLANDS.

Collieries are working on the average only about four days a week now. The reduction in aggregate output tends further to unbalance supplies. While there is a superabundance of house coals, the demand has overtaken supply as regards slacks and smalls. Spot lots are rarely to be picked up; the output being regularly absorbed.

The result is that while quotations for good class domestic fuel are falling, the stiffening tendency of slacks and smalls becomes rather more apparent. Selected house coals can be had at from 35s. to 40s. at the pithead. There has been no formal revision of lists; but concessions of from 1s. to 2s. can be obtained off particular qualities which are over-plentiful.

There is no more activity in industrial fuels. Steams are steady at 20s., or rather less, up to 22s., D.S. nuts fetch 15s. 6d. to 16s. 6d., beans 12s. 6d. to 13s. 6d., and good nutty slacks 8s. to 9s. It is feared expansion of the coke output may be deterred though the stringency in those descriptions of coal which are the mainstay of the ovens. Blast-furnacemen complain bitterly of the premiums demanded for supplementary consignments and the increase of 2s. on forward contracts.

Many gas engineers are now conducting tests of samples preparatory to the placing of new contracts in June. Meanwhile the market for gas coal is featureless.

Glasgow Coke Oven Gas Supply.—Recently Messrs. James Nimmo & Co., Ltd., wrote informing the Glasgow Corporation Gas Committee that they had in contemplation an extension of their coke oven plant at Auchengeich, which would increase the volume and regularity of the gas supply the Corporation were at present receiving under agreement, and asking if the Corporation were prepared to take an additional supply in the event of the Company proceeding with the extensions. The matter was referred to a Sub-Committee to report upon; and at a later meeting they recommended that an additional supply of 2 million c.ft. of coke oven gas per day be taken by the Corporation, who are at present receiving 1 million c.ft. daily from the Company, at the price of 11d. per 1000 c.ft.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 21.

There is little new to report in the tar products market.

Pitch continues quiet, and the price is nominal at about 95s. to 100s. per ton.

Creosote keeps firm at 8½d. to 9d. per gallon, and the quantities available are very limited.

Tar spirits continue steady; pure toluole being about 2s. 3d. to 2s. 4d. per gallon; pure benzole, 2s. 1d. to 2s. 2d. per gallon. Solvent naphtha is quiet at about 1s. 9d. per gallon for 95/160 quality.

Tar Products in the Provinces.

March 21.

The average values for gas-works products during the week were: Gas-works tar, 64s. 6d. to 69s. 6d. Pitch, East Coast, 85s. to 90s. f.o.b. West Coast—Manchester, 82s. 6d. to 89s. 6d.; Liverpool, 85s. to 90s.; Clyde, 87s. 6d. to 90s. Benzole, 90 p.ct., North, 1s. 7d. to 1s. 8d.; crude, 65 p.ct. at 120° C., 1s. 1d. to 1s. 1½d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 8d. to 1s. 9d. Toluole, naked, North, 1s. 8½d. to 1s. 9½d., nominal. Coal-tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5½d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 7½d. to 7¾d.; salty, 7½d. to 7¾d.; Scotland, 7½d. to 7¾d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 1s. 8½d. to 1s. 9½d. prompt. Naphthalene, £11 to £14; salts, 100s. to 110s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Manchester District Tar Prices.

The average price realized in the Manchester district for the sale of tar, according to the sliding-scale, for the month of January was £4 16s. 0·72d. per ton.

Benzole and Petrol Prices.

The National Benzole Company, Ltd., announced last Wednesday a reduction in the price of "National" benzole and "National" benzole mixture of 2d. per gallon wholesale and retail. Closely following was an announcement that a similar reduction would be made in the price of petrol. The new retail prices of the two spirits are as follows:

"National" Benzole Mixture.

London Metropolitan zone: Bulk, 1s. 4½d.; cans, 1s. 4½d. per gallon.
Outer London zone: Bulk, 1s. 4½d.; cans, 1s. 5½d. per gallon.
Provinces: Bulk, 1s. 5½d.; cans, 1s. 6½d. per gallon.

The retail price of "National" benzole throughout the country is 2s. 2d. per gallon.

Petrol.

London and Home Counties: 1s. 3½d. per gallon *ex* pump.
Rest of England and Wales: 1s. 4½d. per gallon *ex* pump.
Scotland: 1s. 5½d. per gallon *ex* pump.

Chichester Gas Company's Capital Issue.—The Directors of the City of Chichester Gas Company are inviting tenders for £4000 of "C" capital stock (ranking for a maximum dividend of 7 p.ct. per annum), at the minimum price of par. Prospectus and form of tender (which latter must be sent in by 11 a.m. on Tuesday, April 19) may be obtained from the Secretary at the Company's offices, Stockbridge Road, Chichester.

Colonial Gas Association Dividend.—We are informed by Mr. C. Holmes Hunt that a cable has been received from Melbourne stating that at a recent meeting of Directors of the Colonial Gas Association, interim dividends were declared at the rate of 8 p.ct. per annum on the preference shares and 9 p.ct. per annum on the ordinary shares, for the half-year ended Dec. 31 last. The dividends will be payable on April 9 next. The Association are issuing at par £125,000 of 6½ p.ct. debentures, for the purpose of adjusting a bank overdraft and of providing for further extensions to meet the needs of the rapidly growing business.

Smoke Abatement Conference.—The Minister of Health has arranged for a conference of representatives of local authorities in the Midland area on the subject of smoke abatement. It will be held in the Council House, Birmingham, at 4 p.m. on April 6; and a representative of the Ministry will preside. The object will be to consider to what extent common measures can be taken by local authorities in the area for the abatement of smoke by discussing difficulties, pooling of information, and securing greater uniformities—a matter which is regarded as of the utmost importance in view of the power to fix standards contained in the new Smoke Abatement Act. In two areas, it is stated, Advisory Regional Committees have already been formed as a result of conferences of this kind, and have been found of much advantage.

Power Efficiency Exhibition.—To the considerable number of power users in the industrial areas of Lancashire and Yorkshire will be presented, in June next, a comprehensive and varied exhibition of machinery and apparatus specifically designed to secure efficiency and economy in the production and use of power. The character of the exhibits will have a distinct appeal to the mills, factories, collieries, &c., which are so strongly represented in the two counties. A feature of the exhibition will be a series of papers to be read by experts on varied subjects. There will also be organized visits by members of interested societies. Further information relative to the Power Efficiency Exhibition may be obtained from Mr. Frank Nasmith, Director and Manager, Textile and Industrial Exhibitions, Ltd., 121, Deansgate, Manchester. The exhibition will be held in the Manchester City Hall.

Radiation Ltd.

The general meeting of shareholders will take place in Birmingham on Monday next, March 28, when the Directors will present the balance-sheet as at Dec. 31, 1926. After bringing £114,507 forward from 1925, the balance of the revenue account is £304,463. Deducting the interim dividends paid in July last, there remains at disposal the sum of £239,723, which the Directors recommend be appropriated as follows: To pay a final dividend of 3 p.ct. on the preference shares, less income-tax, £26,100; a final dividend of 3¼ p.ct. on the fully-paid ordinary shares, free of income-tax, £48,798; a bonus of 6d. per share on the fully-paid ordinary shares, free of income-tax, £34,855; a final dividend of 3¼ p.ct. on the partly-paid ordinary shares, free of income-tax, £5297; a bonus of 3d. per share on the partly-paid ordinary shares, free of income-tax, £3783 13s. 3d.—carrying forward £120,888. The requisite resolutions for capitalization and the increase of the Company's capital foreshadowed in the circular of Jan. 4 last will be submitted for passing. In order to provide for this capitalization, special dividends have been declared by the Company's Subsidiary Companies out of their reserves. Each ordinary shareholder registered on April 13 next will receive in respect of this capitalization one fully-paid ordinary share for every three fully-paid ordinary shares then held; and if this division results in a fraction in any holding, the fraction will be sold and the cash proceeds paid to the shareholder. Any holder of ordinary shares whose calls are in arrear will, unless he pays such calls, only receive in respect of those shares fully-paid ordinary shares calculated upon the amount actually paid up.

Maryborough (Queensland) Gas Company.—For the half-year ended Dec. 31, the Company report a slight increase in gas sales, and a substantial growth in the return from residuals, as compared with the corresponding period of 1925. The payment of a dividend of 7 p.ct. per annum, and the transfer of £593 to reserve for renewals and contingencies, absorbed the balance of £2036 standing at the credit of profit and loss account after providing for all charges.

Imperial Continental Gas Association Dividend.—The following is the dividend resolution of the Board of the Imperial Continental Gas Association. "Subject to the verification of the accounts by the Auditors, and the approval of the proprietors, there be paid, on May 16, 1927, upon the nominal amount of the issued capital stock as registered in the books of the Association on April 20, 1927, a final ordinary dividend for the year ended Dec. 31, 1926, less income-tax at 4s. in the pound, at the rate of 5 p.ct. (actual), making, with the interim dividend of 5 p.ct. (actual) paid on Nov. 15, 1926, a dividend of 10 p.ct. for the year."

Auckland (N.Z.) Gas Company.—It was announced by the Chairman (Mr. J. H. Upton), at the annual meeting, that, in spite of severe competition, the business continued to increase. Though the public lighting had been lost, there was an increase last year of 10¾ million c.ft. in the quantity of gas sold. He complained strongly of the differential treatment of the gas industry in comparison with Power Boards. In the last five years, the Company had contributed the sum of £135,417 in income-tax, while the Power Boards had contributed nothing. Further, Power Boards received an indirect subsidy through the Customs; most electrical plant being free, while gas plant for exactly similar use was subject to duty. Where electric appliances were not free, the duty levied was less than in the case of similar gas appliances. For instance, electric cookers were subject to 20 p.ct. duty, while gas cookers had to pay 25 p.ct. A dividend at the rate of 8 p.ct. per annum was declared.

Gibbons (Dudley), Ltd.—The Directors, in their thirty-second annual report, state that the year 1926 was one of great anxiety, due to the disastrous coal strike; but considerable benefit was derived from outcrop coal working, and from the successful results obtained by the subsidiary companies. The net profit for the year, after providing for depreciation, is £14,510, which, added to the amount brought forward from last year, makes a total of £26,251. Of this, the full preference dividend, and the interim dividends of 7 p.ct. per annum on the ordinary shares, already paid (all free of income-tax), absorbed £11,462, leaving to be now dealt with the sum of £14,788. The Directors' recommendations are that a dividend of 3 p.ct. per annum, free of income-tax, be paid upon the ordinary capital, which, with the interim dividends already paid, will make a total of 10 p.ct. for the year; and that, after payment of Directors' fees, &c., the balance be carried forward.

Thanks and Congratulations at Bradford.—At a meeting of the Council of the Bradford Chamber of Trade, on the motion of Mr. E. Smith (ex-President of the National Federation of Coal Merchants), seconded by Mr. A. Fletcher (Coal Merchants' Section of the Chamber), a resolution was passed expressing thanks to Mr. Charles Wood, the recently retired City Gas Engineer and General Manager, for his past services—and particularly for releasing gas coal for general purposes during the coal strike—and wishing him a speedy and complete recovery from his breakdown in health. The meeting also passed a resolution of congratulation, on his appointment to the chief post in the Gas Department, to Mr. E. J. Sutcliffe, with whom, as the Deputy Gas Engineer, local coal merchants had many happy associations during the mutual efforts to maintain fuel supplies. Mr. Smith said he had no doubt that the severe extra strain of the long coal strike, and extra duties as coal emergency officer, had a good deal to do with undermining Mr. Wood's health.

The Ossett Town Council have approved a scheme adopted by the Gas Committee for systematic training of apprentices to gas-fitting work.

It was reported to the Sedgley Urban District Council last week that the coal dispute had cost the Gas Committee approximately £3000. The price of gas was not increased until the last quarter; and it was hoped that it would soon be possible to reduce it again.

STOCK MARKET REPORT.

REVIEWING the happenings on the Stock Exchange last week, it is clear that nervousness with regard to the anticipated Budget proposals, the possible effect of the petrol war, and the less satisfactory news from China were the predominant features. While it is true that these influences had little or no effect on the Gilt-Edged Market, which if anything was firmer, the tendency in other markets was distinctly irregular. The Budget rumours mainly affected Tobaccos, and prices slumped badly; but in the absence of any extreme additional taxation, the known strength of the various companies' reserves should lead to a speedy recovery. Considerable anxiety exists with regard to the Oil Market, which was flooded with large parcels of shares for which there were few buyers.

A satisfactory feature of the Foreign Market was the improvement in the price of French Rentes; both the 5 p.ct. and the 4 p.ct. loans being substantially higher than a month ago.

Values of Gas Stocks were also maintained. With the payment of dividends for the past half-year, and the consequent marking down of the quotations, prices are more comparable. It will be noticed from the Table that the Brighton and Hove Company's stocks are now quoted on the converted value. Incidentally, it may be mentioned that, with the exception of the Brighton and Hove 6 p.ct. consolidated, the North Middlesex 6 p.ct. consolidated, and the South Shields 7 p.ct. consolidated, there are now no companies included in the Table in respect of which the standard or basic dividend exceeds 5 p.ct. The variations in the quotations were all on the up grade; Alliance and Dublin leading the way with a rise of 2 points.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 18.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C. .	70—73	..	71
333,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	66—71	..	69½
1,551,848	,,	Sept. 30	6½	6½	Alliance & Dublin Ord. .	83—88	+2	88—86
274,000	,,	Jan. 13	4	4	Do. 4 p.c. Deb. . .	65—68	..	68½
800,000	1	Oct. 14	1/7½	1/7½	Bombay, Ltd. . . .	1—1½	..	..
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c. . .	123—131*	..	..
600,050	10	,,	7	7	Do. B 7 p.c. . .	114—123*	..	124
275,000	10	,,	6	6	Do. Pref. 6 p.c. .	103—113*	..	..
50,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb. .	55—56	..	..
103,025	,,	,,	4	4	Do. 4 p.c. Deb. .	78—76	..	75—76
367,900	,,	—	—	—	Brighton & Hove 6 p.c. Con.	100—105	..	..
341,800	,,	—	—	—	Do. 5 p.c. Con.	90—95	..	..
1,327,500	,,	Feb. 24	5	5	Bristol 5 p.c. max. . .	88—89a	+½	..
885,000	,,	Sept. 30	7	8	British Ord.	107—110	..	109½
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref. . .	112—117	..	..
192,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	75—80	..	..
100,000	10	Dec. 9	8	6	Cape Town, Ltd. . . .	7—8	..	..
100,000	10	Oct. 28	4½	4½	Do. 4½ p.c. Pref. . .	6—7	..	..
180,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb. . .	68—73	..	..
666,860	,,	Feb. 24	6	6	Cardiff Con. Ord. . . .	95—98	..	..
287,860	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb. .	100—103	..	..
197,150	,,	Feb. 24	5	6½	Chester 5 p.c. Ord. . . .	86½—91½b	..	..
79,185	1	Sept. 30	‡2/-	‡2/-	Colombo Ltd. Ord. . . .	27/—29/-	..	..
24,495	1	,,	1/4‡	1/4‡	Do. 7 p.c. Pref. .	20/—22/-	..	..
221,490	1	Oct. 14	1/9‡	1/7½	Colonial Gas Assn. Ld. Ord.	25/—27/-	..	..
173,900	1	,,	1/9‡	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	..
1,518,280	Stk.	Feb. 24	5½	5½	Commercial 4 p.c. Cap. .	83—86	+1	84½—85½
560,000	,,	,,	5/8/4	5/8/4	Do. 8½ p.c. Cap. .	80—83	..	81½
475,000	,,	Dec. 30	8	8	Do 8 p.c. Deb. . .	54—57	..	56
800,000	,,	Sept. 30	‡2	‡1	Continental Union, Ltd. .	28—33	..	..
200,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref. . .	79—82*	..	..
727,560	,,	Mar. 10	6½	6½	Croydon sliding scale . .	96—99*	..	..
488,100	,,	,,	5	5	Do. max. div. . . .	77—80*	..	79
492,270	,,	Feb. 24	6	9	Derby Con.	106—108e	..	..
55,000	,,	Dec. 30	4	4	Do. Deb.	78—75e	..	..
209,000	,,	Mar. 10	5	5	East Hull Ord. 5 p.c. .	76—80*	..	..
50,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,009,180	10	Sept. 30	†4	†3	European, Ltd.	6—7	..	6½—6½
18,747,460	Stk.	Feb. 10	5/1/4	5	Gas Light & Coke 4 p.c. Ord.	86½—88½	..	87—88
3,600,000	,,	,,	3½	3½	Do. 8½ p.c. max. . .	58—61	..	59½—60½
4,187,090	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	74—77	..	76
5,809,620	,,	Dec. 30	3	3	Do. 3 p.c. Con. Deb. .	58—61	..	59½
181,815	,,	,,	—	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	..
1,542,770	,,	,,	—	5	Do. 5 p.c. Red. Deb. .	99—100	..	99½
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb. .	..	..	..
82,500	,,	Mar. 10	6½	6½	Hastings & St L. 5 p.c. Conv	88—90*	..	..
268,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	65—70*	..	..
70,000	10	Oct. 14	†10	†10	Hongkong & China, Ltd. .	12—13	..	..
178,200	Stk.	Mar. 10	5	5	Hornsey Con. 3½ p.c. .	67—69*	..	..
1,976,000	,,	Nov. 11	‡10	10	Imperial Continental Cap.	134—137	+1	131½—137
396,170	,,	Feb. 10	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	..
388,242	,,	Mar. 10	6½	6½	Lea Bridge 5 p.c. Ord. . .	92—97*	..	..
3,148,907	,,	Feb. 24	5½	5½	Liverpool 5 p.c. Ord. . .	80½—81½b	+½	81
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	104—106b	..	..
165,786	,,	Feb. 24	9	8	Maidstone 5 p.c. Cap. . .	110—115	..	..
63,480	,,	Dec. 30	3	3	Do. 3 p.c. Deb. . .	52—57	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean .	6½—6½	..	..
541,920	Stk.	Nov. 25	†6	†5	Montevideo, Ltd. . . .	80—85	..	82½
3,061,315	,,	Feb. 24	5	5	Newcastle & Gateshead Con.	72½—73½d	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref. .	68½—69½d	..	..
691,705	,,	Dec. 30	8½	8½	Do. 8½ p.c. Deb. .	68—69d	+1	..
131,785	,,	—	—	—	North Middlesex 6 p.c. Con.	93—95	..	..
800,000	,,	Nov. 25	7	9	Oriental, Ltd.	97—102	..	..
188,120	,,	Dec. 30	7½	7½	Plym'th & Ston'house 5 p.c.	105—110	..	..
414,500	,,	Feb. 24	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	100—105	..	..
286,732	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	..
3,389,909	1	—	—	—	Primitiva Ord.	14/—15/-	..	14/4½—14/9
282,200	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb. .	85—87	..	86
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	..	71—71½
434,963	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb. . .	70—72	+1	..
160,000	10	Sept. 30	6	6	San Paulo 6 p.c. Pref. . .	7½—8	..	..
135,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	..
270,000	Stk.	Sept. 16	6	5½	Sheffield A	96—98e	..	..
419,968	,,	,,	6	5½	Do. B	96—98e	..	..
1,047,000	,,	,,	6	5½	Do. C	96—98e	..	..
90,000	10	June 11	4	—	South African	4—6	..	..
4,609,895	Stk.	Feb. 24	5	7	South Met. Ord.	97—99	..	97½—98½
1,895,445	,,	Jan. 13	3	3	Do. 3 p.c. Deb. . .	57—60	..	58½
734,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	99—101*	..	100—101
91,500	,,	Feb. 24	6½	6½	South Shields Con. . . .	108—110d	..	..
1,343,795	,,	Mar. 10	6½	6½	South Suburban Ord. 5 p.c.	100—103*	..	101½—102½
368,887	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	93—96	..	..
647,740	,,	Oct. 14	5	5	South'mpton Ord. 5 p.c. max.	76—79	..	..
121,975	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—73	..	..
250,000	,,	Feb. 24	7	7	Swansea 7 p.c. Red. Pref. .	100—102	..	..
200,000	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,000	,,	Feb. 24	7½	7½	Tottenham District A 6 p.c.	105—110	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	89—92	..	90—91
180,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
388,251	,,	Aug. 26	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c. . . .	69½—70½d	..	..
197,224	,,	Mar. 10	6½	6½	Do. 5 p.c. pref. .	85—90*	..	..
88,880	,,	,,	5	5	Do. 5 p.c. Maidenh'd	88—88*	..	..
91,600	,,	,,	6½	6½	Wandsworth, Wimbledon, and Epsom—	88—88*	..	..
80,000	,,	Mar. 10	8½	8½	Wandsworth A 5 p.c. .	119—194*	..	..
265,686	,,	,,	7	7	Do. B 3½ p.c. .	99—104*	..	103
433,535	,,	,,	5/12/0	5/12/0	Do. C and New	97—92*	..	91
252,000	,,	,,	6½	6½	Wimbledon 5 p.c. . . .	95—100*	..	..
96,000	,,	,,	7½	7½	Epsom 5 p.c.	101—106*	..	104½
88,416	,,	Dec. 30	3	3	3 p.c. Deb.	54—57	..	..

Quotations at :—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. *Ex. div. † Paid free of income-tax. ‡ Plus 5½ p.ct. p.a. special dividend. § For year.

The following transactions were recorded during the week:

On Monday, Aldershot "C" 71, Alliance and Dublin 83, Bournemouth 7 p.ct. maximum 12½, European 6½, Gas Light and Coke 87½, 87⅝, 87½, 87⅝, Imperial Continental 134⅜, 135, 136½, Primitiva 14s. 4½d., 14s. 6d., 14s. 9d., South Metropolitan 98, South Suburban 5 p.ct. 101½, 101⅜, 102. Supplementary prices, Reading 5 p.ct. 85½, 86, 86½, 87.

On Tuesday, Bristol 5 p.ct. 88, 89½, Commercial 3½ p.ct. 81½, 3 p.ct. debenture 56, European 6½, 6⅞, Gas Light and Coke 87, 87½, 87⅝, 87½, 87¾, 4 p.ct. preference 76, 5 p.ct. debenture 99⅜, Imperial Continental 135½, Primitiva 14s. 4½d., 14s. 6¾d., 14s. 7½d., 14s. 9d., South Metropolitan 97½, 98, 3 p.ct. debenture 58¾, 6½ p.ct. debenture 100½, 101, South Suburban 5 p.ct. 101½, 101¾, Tottenham "B" 90, 91, Wandsworth "B" 103, "C" 91. Supplementary prices, Barnet "D" Water 97, 98, Liverpool 5 p.ct.

On Wednesday, Aldershot 4 p.ct. preference 69½, Commercial 4 p.ct. 84¾, 85, 85½, 85½, European 6½, Gas Light and Coke 87½, 87⅞, 88, 3 p.ct. debenture 59½, Imperial Continental 135½, 136, Primitiva 14s. 4½d., 14s. 7½d., 14s. 9d., South Metropolitan 97½, 98, 98⅜, 98½, South Suburban 5 p.ct. 101¾, 102½. Supplementary prices, Bournemouth new 6 p.ct. preference fully paid £11 7s., Brentwood 6 p.ct. preference 93, 93½, Lea Bridge 7 p.ct. debenture 100, Tottenham 7½ p.ct. mortgages 102½, 102¾, Yorktown and Blackwater 5½ p.ct. debenture 100½, 100¾.

On Thursday, Alliance and Dublin 4 p.ct. debenture 65⅝, British 109⅜, European 6½, Gas Light and Coke 87½, 87½, 88, 3½ p.ct. 59½, 60½, Imperial Continental 134½, 135, 135½, Primitiva 14s. 6¾d., 14s. 7½d., 4 p.ct. 1st debentures 85, South Metropolitan 98, 98½, 98⅝, 6½ p.ct. debenture 100½, Wandsworth Epsom 5 p.ct. 104½. Supplementary prices, Eastbourne 3½ p.ct. "B" 105.

On Friday, Alliance and Dublin 85, Bournemouth 4 p.ct. debenture 75, 76, Croydon maximum dividend 79, European 6½, Gas Light and Coke 87⅛, 87½, 3½ p.ct. 59½, Imperial Continental 137, Montevideo 82⅞, Primitiva 14s. 4½d., 14s. 6d., 14s. 9d., 4 p.ct. debenture 71, 71½, South Metropolitan 97⅛, 98½, 3 p.ct. debenture 58¾, 6½ p.ct. debenture 100.

With the close of the week, as is usual, easier monetary conditions prevailed in Lombard Street. Old day-to-day loans were renewed at 3¾ p.ct., and new money was available at the same rate. The prospect for the current week is not so good, as tax transfers may have some influence and rates will probably be firmer. Discount rates were steady, Treasury Bill allotments having no effect on rates. The Bills offered and allotted (£35,000,000) averaged £4 7s. 3·23d. p.ct., or 1·12d. p.ct. above the rate for the previous week.

Foreign Exchanges were active, particularly Italian and Spanish currencies. Italian lire moved up steadily, and closed at 105.20, and Pesetas fell to 27.63¾. French francs were steady at 124. Belgas closed at 34.92¾, and the German exchange at 20.46¼.

Silver was firmer, and the price advanced to 25 7/16d. per oz. on fairly extensive Indian buying. No Gold was available, and the price remained at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3, 1925. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

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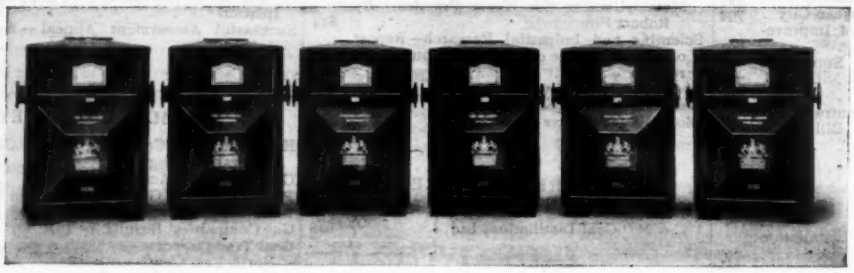

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